CHAMBERS'S

# ENCYCLOPÆDIA

## A DICTIONARY
OF
## UNIVERSAL KNOWLEDGE

NEW EDITION

VOL. VI.

HUMBER TO MALTA

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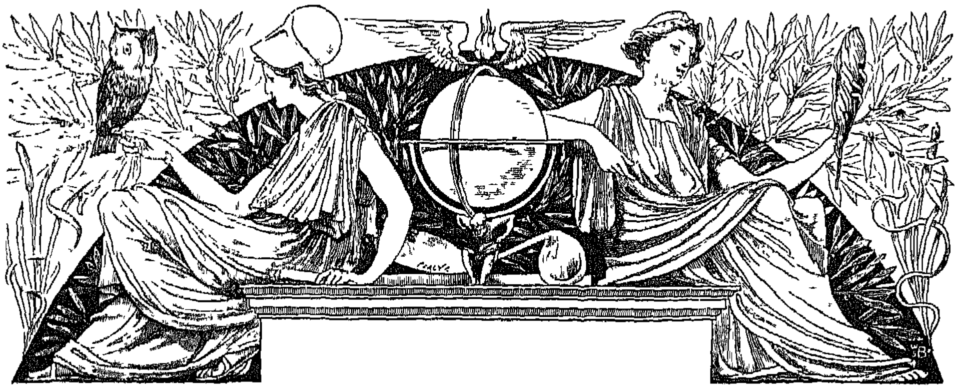

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◆

**Humber,** the estuary of the rivers Ouse and Trent (and so of the Dove, Derwent, Wharfe, &c.), runs east and then south-east for a length of 38 miles, separating the counties of York and Lincoln, with a breadth varying from 1 to 7 miles. Its drainage basin, with an area of 9770 miles, is the largest in England; and by means of navigable streams and canals the Humber is connected across England with the Mersey, the Severn, and the Thames. The navigation is obstructed, especially on the north side, by banks and shoals. The Humber was the southern boundary of the ancient kingdom of Northumbria in the wider sense, and of Deira when Northumbria was divided into Bernicia and Deira; Mercia lay south of the estuary. By way of the Humber Danes and Northmen made many terrible incursions into England, notably in 867, 1013, 1066, and 1069. The great port on the Humber was anciently Ravenser or Ravenspur, just inside Spurn Head. The process of erosion by the sea was already at work when Henry Bolingbroke landed here in 1399; soon after the place was wholly covered by the encroaching waters, and Hull (q.v.) became the great port on the north shore, as Grimsby (q.v.) now is on the southern side. See *The Rivers of England* (Cassell, 1889).

**Humbert.** See ITALY.

**Humble-bee.** See BEE.

**Humboldt,** a river of Nevada, rises in the NE. part of the state, and flows WSW. to Humboldt Sink, a lake over 40 miles in circumference, which has no outlet. Length, nearly 350 miles. The river, which is unnavigable even for canoes, is strongly impregnated with alkaline matter. The region through which it flows is barren, and the banks are destitute of trees or shrubs. The Central Pacific Railroad runs through the valley of the Humboldt.

**Humboldt,** FRIEDRICH HEINRICH ALEXANDER, BARON VON, one of the greatest of naturalists, was born at Berlin, 14th September 1769. His father, whom he lost when he was not quite ten years of age, was chamberlain to the king of Prussia. He studied at the universities of Frankfort-on-the-Oder, Berlin, and Göttingen; and during his residence at Göttingen (1789–90) he made those visits of scientific exploration, the fruit of which was his first independent work, a treatise on the basalts of the Rhine. In the spring and summer of 1790 he made a tour through Belgium, Holland, England, and France. In June 1791 he entered the Mining Academy at Freiberg, where he enjoyed the instructions of Werner. His eight months' residence here led to the publication of his *Flora Subterranea Fribergensis* (1793). He was afterwards appointed to an office in the mining department, and spent some years in this capacity, chiefly at the Fichtelgebirge, in Upper Franconia. His researches here resulted in a work on the irritability of the muscular and nervous fibres of animals (1799). The desire of visiting tropical countries, however, led him to resign his office, and devote himself entirely to the study of nature. He spent three months at Jena, where he was the intimate associate of Goethe and Schiller. At Paris he contracted a friendship with Aimé Bonpland, afterwards his companion in many and various scenes. Some time after he obtained permission from the Spanish government to visit all the Spanish settlements in America and the Indian Ocean. He sailed from Corunna along with Bonpland on 5th June 1799. They visited Teneriffe, ascended the Peak, and made many scientific observations. On 16th July they arrived at Cumana in South America, and in the course of five years explored a vast extent of territory in what are now Venezuela, Colombia, Ecuador, and Peru, as well as in Mexico, which they crossed from west to east. In Havana Humboldt prepared materials afterwards employed in his *Essai Politique sur l'Isle de Cuba* (1826). At Paris he occupied himself in the arrangement of his collections and manuscripts, and jointly with Gay-Lussac made experiments on the chemical constitution of the atmosphere. Having visited Italy, and returned to Berlin, he accompanied Prince Wilhelm of Prussia in 1807 on a political mission to France, and obtained leave from the government of his own country to remain there for the publication of his travels, for which the disturbed state of Germany at that time did not allow proper opportunity. He continued to reside in Paris till 1827. The wish of the king that he should reside in his native country was gratified in 1827, when he proceeded to Berlin, and there, in the winter of 1827–28, he gave lectures on the *Cosmos*, or physical universe.

In 1829 Humboldt again became a traveller, the Emperor Nicholas then sending out a well-appointed expedition to the north of Asia, to explore the Ural and Altai Mountains, Chinese Dzungaria, and the Caspian Sea. In this expedition Humboldt was accompanied by his two friends Ehrenberg and Rose. Its principal results were the scientific examination of the beds which produce gold and platina, the discovery of diamonds in an extra-tropical region, the astronomical determination of positions, magnetic observations, and geological and botanical collections. The whole journey occupied nine months, and extended to 2320 miles, and is described in a work by Rose (2 vols. 1837–42) and in Humboldt's *Asie Centrale* (3 vols. 1843). The political changes of the year 1830 led to Humboldt's employment in political services; he was chosen by the king of Prussia to carry to Paris his recognition of Louis-Philippe, and during the ensuing twelve years was frequently sent to Paris to reside for four or five months. He accompanied the king of Prussia also in visits to England, Denmark, &c. During this time he published his *Examen Critique de la Géographie du Nouveau Continent* (5 vols. 1835–38). Humboldt spent the later years of his long life at Berlin, where he occupied a high position at the Prussian court. His last great work, *Cosmos* (4 vols. 1845–58), has been unanimously recognised as one of the greatest scientific works ever published, exhibiting in most lucid arrangement many of the principal facts of the physical sciences and their relations to each other. The style, however, is somewhat heavy, and, seen from our present standpoint, the author's views are in many respects defective. The germ of the work was the author's lectures in Berlin in 1828, further developed in *Ansichten der Natur* (1808). Humboldt died in his ninetieth year, May 6, 1859.

It is not easy to estimate the amount of Humboldt's contributions to science. The geography of Spanish-America was most imperfectly known previous to his travels there, during which he astronomically determined more than 700 positions, and he bestowed much labour on the preparation of the maps in which his discoveries were exhibited. His barometrical observations were likewise very numerous, as well as his observations an all points connected with meteorology. To him we are indebted for the most important generalisations concerning magnetism and also climate. He obtained distinction also by his labours in the determination of the magnetic equator, and by his observations on electrical eels, and on the respiration of fishes and young crocodiles. The editing and preparing of the great work of the American journey occupied twenty years of his life; and in his work he had the assistance of many of the most eminent scientists of the time—Cuvier, Latreille, Gay-Lussac, Thenard, &c.—as well as the most distinguished artists and engravers. There is but one complete edition of the *opus magnum* (1807–17), in 30 vols. (20 folio and 10 quarto); the so-called small edition being but excerpts. The title of the whole is *Voyages aux Régions Equinoxiales du Noveau Continent, fait en 1799–1804 par Alexandre de Humboldt et Aimé Bonpland, rédigé par Alexandre de Humboldt*; and it falls into six sections, some of which and their parts are quoted as separate works (*Relation Historique, Observations de Zoologie, Observations Astronomiques, Physique générale et Geologie, Plantes Équinoxiales*, with atlases, essays, &c.). Humboldt is unquestionably one of the great figures of the century, and in private life was remarkable for benevolence and kindliness, while his most conspicuous defect was vanity.

See the great biographical work, edited by Bruhns, *Alexander von Humboldt: eine wissenschaftliche Biographie* (1872; Eng. trans. 1873); and Lord Houghton's *Monographs* (1873). His correspondence with many of the most eminent men of the time has been published in many separate works—thus, that with Varnhagen (1860), with Von Raumer (1869), with Goethe (1876), with Campe (1877), with his brother Wilhelm (1880).

**Humboldt,** KARL WILHELM VON, the elder brother of the preceding, eminent as a statesman and for his works on philology, æsthetics, and general literature, was born at Potsdam, 22d June 1767, and educated at Berlin, Frankfort-on-the-Oder, and Göttingen. He eagerly studied antiquities, æsthetics, and the Kantian philosophy, as well as law, to which he professedly devoted himself. After travelling in Germany, France, and Switzerland, he acquired the rank of counsellor of legation, but showed little inclination for official employment. In 1791 he married, and for some years resided chiefly on his wife's estate in Thuringia, and afterwards in Jena, associating most intimately with Schiller, and devoting himself to poetry and other literary and scientific pursuits. A valuable memorial of his friendship with Schiller is the correspondence between them. From 1797 to 1799 Humboldt resided partly in Paris and partly in Spain, and in 1801 became Prussian resident at Rome, where he remained for a number of years in this capacity, and in that of minister-plenipotentiary, a most generous patron of young artists and men of science. From Rome he returned to his native country to fill the high place of first minister of Public Instruction. The Berlin university owed its existence to him. In 1810 he went to Vienna as minister-plenipotentiary, and from this time he took part in all the most important political affairs in which his country was concerned. After 1819 he resided chiefly at Tegel, where he laid out fine pleasure-grounds, and formed a noble collection of sculptures by the greatest masters. He died 8th April 1835.

His earliest literary works were collected by himself under the title of 'Æsthetic Essays' (*Æsthetische Versuche*, 1799). His 'Collected Works' appeared in 7 vols. (1841–52). Humboldt devoted himself with the greatest assiduity to the study of philology, and was the first to make the study of the *Basque* tongue a scientific pursuit. He also spent much labour on the languages of the East, various questions connected with oriental literature, and the languages of the South Sea Islands. One of his most important works is on the Kawi language in Java (3 vols. 1836–40), published after his death by Edward Buschmann; the introduction to this, On the Variety of Structure in Human Speech, and his reflections on the influence thereof on the intellectual progress of mankind, mark a new era in the science of philology. *Letters to a Female Friend* (1847; Eng. trans. 1849) exhibit his character in a most pure and amiable light. See the admirable biography by Haym (1856), and his correspondence with Schiller (1830; new ed. 1876), Goethe (1876), Körner (1879), and his brother Alexander (1880).

**Hume,** David, philosopher and historian, was born at Edinburgh on the 26th of April 1711 (o.s.). His father was the laird or proprietor of the estate of Ninewells, in Berwickshire, but David, being the younger son, had to make his own fortune with no other assistance than an education and the influence of his respectable family. He was educated at home and at the university of Edinburgh. His father designed law as his profession, and he submitted to the initial steps of the proper practical training, but it was not a pursuit to his liking. Deserting it, he made experiment of a mercantile life in Bristol; but commerce was not more congenial to him than jurisprudence, and he gave it a very short trial. He now became a student, devoting himself to books with no settled practical object before him. He has recorded his sufferings at this time from despondency and depression of spirits, caused apparently by the effects of monotonous study. At twenty-three years of age he went to France and lived some time in La Flèche, where he describes himself as wandering about in solitude, and dreaming the dream of his philosophy. In 1739 he published the first and second book of his *Treatise on Human Nature*—the germ of his philosophy, and still perhaps the best exposition of it, since it has there a freshness and decision approaching to paradox, much modified in his later works. Although the dawn of a new era in philosophy, this book was little noticed; in his own words, 'it fell dead-born from the press.' It was a work of demolition. By separating the impressions or ideas created on the thinking mind by an external world from the absolute existence of that world itself he showed that almost everything concerning the latter was taken for granted, and he demanded proof of its existence of a kind not yet afforded. It was thus that he set a whole army of philosophers at work, either to refute what he had said, or seriously to fill up the blanks which he discovered: thus he gave the original impulse both to the Scottish school of philosophy—Reid, and the rest—and to Kant's speculations. In 1741 and 1742 he published two small volumes called *Essays Moral and Political*; they were marked by learning and thought, and elegantly written, but are not among the more remarkable of his works.

He felt keenly at this time the want of some fixed lucrative pursuit, and his longing for independence was the cause of a sad interruption to his studious and philosophical pursuits. He was induced to become the companion or guardian of an insane nobleman, and had to mix with the jealousies and mercenary objects of those who naturally gather round such a centre. In 1747 he obtained a rather more congenial appointment as secretary to General St Clair, whom he accompanied in the expedition to the coast of France and the attack on Port L'Orient, the depôt of the French East India Company; this affair had no important results, but it gave Hume a notion of actual warfare. Next year he accompanied the general in a diplomatic mission to France, and as he travelled he took notes of his impressions of Holland, Germany, and Italy, which are published in his *Life and Correspondence*.

In 1751 he published his *Inquiry into the Principles of Morals*, a work of great originality, and one of the clearest expositions of the leading principles of what is termed the utilitarian system. At the same time he intended to publish his *Dialogues concerning Natural Religion*; but his friends, alarmed by the sceptical spirit pervading them, prevailed on him to lay them aside, and they were not made public until after his death. In his thirty-fifth year he had unsuccessfully competed for the chair of Moral Philosophy in Edinburgh, and at this period we find him unsuccessful in an attempt to obtain the chair of Logic in Glasgow. Next year, in 1752, appeared his *Political Discourses*. Here, again, he made an era in literature, for in this little work he announced those principles of political economy, comprehending the doctrine of free trade, which it fell to his friend Adam Smith more fully and comprehensively to develop. He was appointed at this time keeper of the Advocates' Library, with a very small salary, which he devoted to a charitable purpose. It was here that, surrounded with books, he formed the design of writing the history of England. In 1754 he issued a quarto volume of the *History of the Stuarts, containing the Reigns of James I. and Charles I.*, and presently completed this portion of the work in a second volume, bringing it down to the Revolution. The second volume attracted more notice than the first had done. He then went backwards through the House of Tudor, and completed the work from the Roman period downwards in 1762. While so employed he published *Four Dissertations: the Natural History of Religion; of the Passions; of Tragedy; of the Standard of Taste* (1757). Two other dissertations, intended to accompany these, were cancelled by him after they were printed—they are *On Suicide* and *The Immortality of the Soul*, and were subsequently printed in his works.

In 1763 he went to France as secretary to Lord Hertford's embassy; here he was in his element, and found fame at last. He became familiar with the brilliant wits and savants of the Parisian circle—with Turgot, D'Alembert, Helvetius, Holbach, Diderot, Buffon, Malesherbes, Crebillon, and the rest, as well as with the hardly less distinguished women, De Boufflers, Du Deffand, and L'Espinasse. His sojourn in Paris was unfortunate in bringing him into intimacy with the restless, vain, and self-tormenting Rousseau, who, after experiencing much substantial kindness from Hume, got suspicious, and forced him into a memorable quarrel. After his return home, in 1766, he accepted the responsible office of Under-secretary of State for the Home Department. In his own Life he says: 'I returned to Edinburgh in 1769 very opulent (for I possessed a revenue of £1000 a year), healthy, and, though somewhat stricken in years, with the prospect of enjoying long my ease, and of seeing the increase of my reputation.' His health gave way in 1774, and he died at Edinburgh, 25th August 1776.

Hume is the outcome of the empirical philosophy of Locke. His philosophical writings do not form a system, but discuss many of the salient ideas of philosophy, mainly in a sceptical or destructive manner. Ideas are but weakened copies of 'impressions' of the senses, outer or inner; mind is a succession of isolated impressions and ideas; the idea of cause depends on the habit of mind which expects the event that usually follows on another, and there is no necessary connection between cause and effect. Hume's History, which gives him a high rank among English historical authors, was not remarkable for historic impartiality (in a later edition more than a *hundred alterations on the reigns of the first two Stuarts* were made by Hume himself, and all to the Tory side), and has been largely superseded by more modern works; but new editions, with or without the continuation by Smollett, still appear; Dr Brewer's *Student's Hume* (1878) being a recognised text-book. Hume's position in relation to his predecessors and successors is given under Berkeley; the article Causality is largely concerned with the discussion of his views. For the influence of Hume's scepticism in awaking Kant from his dogmatic slumber, see Kant. The most important edition of Hume's works is that by T. H. Green and T. H. Grose (4 vols. 1874), with introduction and exhaustive analysis of Hume's philosophy. *The Life and Correspondence of David Hume* was published by J. Hill Burton (2 vols. 1846); Dr G. Birkbeck Hill edited *Letters of David Hume to William Strahan*, with copious and valuable notes, in 1889. For his theological position, and his relation to Edinburgh society, complicated by his 'infidelity,' see Leslie Stephen's *English Thought in the Eighteenth Century* (1876), the autobiography of 'Jupiter' Carlyle, &c. There are short monographs on Hume and his work by Professor Huxley ('English Men of Letters' series, 1879) and Professor Knight ('Philosophical Classics' series, 1886); and German works on him by Jodl (1872), E. Pfleiderer (1874), and Gizycki (1878).

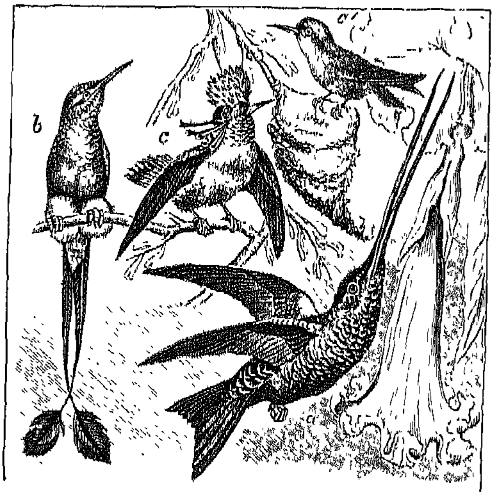
**Hume,** Joseph, politician, was born in January 1777, at Montrose. He studied medicine at Edinburgh, and in 1797 became assistant-surgeon in the service of the East India Company. He applied himself to the acquisition of the native languages, and during the Mahratta war, from 1802 to 1807, filled some half-dozen important offices, chief amongst which were those of interpreter and commissary-general. On the conclusion of peace he returned to England in 1808, his fortune made. Becoming imbued with the political philosophy of James Mill and Bentham, he gained admission to parliament, sitting as member for Weymouth, Aberdeen, Middlesex, Kilkenny, and Montrose successively, this last from 1842 to his death, which occurred on 20th February 1855. 'An uncompromising honesty, an instinctive hatred of abuses, an innate love of liberty, and an unflinching will to extend its benefits to others—these, and the close experience of men derived by himself during the earlier part of his life, rendered Mr Hume one of the most powerful, and at the same time one of the most practical, of reformers in a reforming age.' Amongst the schemes and reforms he advocated may be enumerated the establishment of savings-banks, freedom of trade with India, abolition of flogging in the army, of naval impressment, and of imprisonment for debt, repeal of the act prohibiting export of machinery, and of that preventing workmen from going abroad, reduction of election expenses, abrogation of duties on paper, and removal of abuses of all and sundry kinds whatsoever. He was also chief agent in discovering the treasonable designs of the Orange lodges, which proposed to make the Duke of Cumberland king on the decease of William IV.

**Hume,** Patrick (1641-1724), an eminent statesman and covenanter, Lord Chancellor of Scotland, who in 1690 was created Lord Polwarth, and in 1697 Earl of Marchmont. See Baillie (Lady Grizel).

**Humeral,** an oblong scarf worn by priests and sub-deacons round their shoulders at certain parts of the service of the Mass and of Benediction, the paten, pyx, or monstrance being also wrapped in it (so as to prevent contact at those times with naked hands).

**Hummel,** Johann Nepomuk, pianist and musical composer, was born at Presburg, 14th November 1778. He first studied under Mozart, and then, after a seven years' concert tour in Germany, Denmark, England, and Holland, he returned to Vienna to complete his musical education under Albrechtsberger and Salieri. From 1803 to 1811 he held the post of musical director to Prince Esterhazy; and in 1816 he filled a similar position at Stuttgart, but moved four years later to Weimar, where he died, October 17, 1837. In the course of several musical tours he delighted the capitals of Europe with his pianoforte playing and his clever improvisations on that instrument. Of his musical compositions the only ones which have value at the present day are his pianoforte works.

**Humming-bird** (*Trochilus*), a Linnean genus of birds, now constituting a family, Trochilidæ. The nearest relations of the humming-birds are the Swifts (q.v.); that they form together with the swift one large group is clear from their very close resemblances in anatomical structure. Nitzsch, Huxley, Garrod, and others who have investigated the osteology, muscular anatomy, and other points concur in this opinion as to the relationship of the family; they resemble in their habit and in brilliancy of plumage the Sun-birds (q.v.), which replace them in the eastern tropical regions. The dazzling brilliancy of humming-birds, the extreme rapidity with which they dart through the air, their hovering above the flowers from which they obtain their food, with humming sound of wings, which move so quickly as to be indistinctly visible, or 'like a mist,' have attracted universal admiration since the first discovery of America. The diminutive size of almost all of them—some of them being the smallest of birds, and if stripped of their feathers not larger than a humble-bee—has still further contributed to render them objects of interest, whilst the plumage of the different species exhibits an almost endless variety of colours. Some species possess 'the most gorgeously brilliant metallic hues known among created things;' some on the other hand are sombre in hue. Humming-birds are entirely confined to the American continent and West Indies, where there are about 120 genera, containing over 400 species; no less than 15 species occur in North America. Of the South American forms the majority inhabit the hotter regions, but some are confined to elevated mountain-tracts even above the snow-line.



*a*, Sword-bill Humming-bird (*Docimastes ensifer*); *b*, White-booted Racket-tail (*Steganurus Underwoodi*); *c*, *c'*, male and female Tufted Coquette (*Lophornis ornata*).

Humming-birds have slender bills, which are also generally long, and in some extremely so, the form of the bill exhibiting a wonderful adaptation to the kind of flowers from which the bird obtains its food—straight in some, curved in others. Humming-birds do not, as was long supposed, feed on honey alone, but to a considerable extent, and some of them perhaps chiefly, on insects, not rejecting spiders, whilst they often snatch away the insects which have become entangled in spiders' webs. The tongue is very long, capable of being darted out to a considerable length; the bone of the tongue (hyoid bone) being much elongated, and its branches passing round the back of the skull to the forehead, where they meet in a point before the line of the eyes. The tongue itself consists of two hollow filaments, joined together for the greater part of their length, and separated at the tip; the structure of the tongue and hyoid bones is curiously like that of the Woodpeckers (q.v.) and the sun-birds already referred to; this affords an illustration of the fact that similar requirements often cause development of similar structures in animals otherwise distinct. The wings of humming-birds are very long and powerful, like those of the swifts, the length being particularly marked in that portion of the wing which corresponds to the hand of mammals; hence the name Macrochires which is applied to the group. Humming-birds construct their nests with nice art, generally of lichens and of fibrous substances, such as cotton. They do not lay more than two eggs. They are very bold in defence of their nests and young, and are said to strike fearlessly with their needle-like bills at the eyes of birds of prey, which they far surpass in agility and rapidity of flight. They are very easily tamed and rendered familiar, and have been known to return again in spring, after a winter migration to a warmer climate, to the window from which they had been allowed to escape. Attempts to keep tamed humming-birds have generally failed, perhaps on account of their being supposed capable of feeding only on honey or syrup, whereas insect food seems necessary for them. Attempts made to bring them across the Atlantic have, in the great majority of cases, been unsuccessful.

The skins of humming-birds were employed for ornamental purposes by the more civilised American races before the discovery of America by Europeans, and were used by the Mexicans for making those pictures which so much attracted the admiration of their Spanish conquerors.

The great authority on the humming-bird is John Gould, whose *Monograph on the Trochilidæ* (5 vols. and 5 supplements, 1849-87) was published at the price of £83, and is magnificently illustrated. His collection of stuffed specimens was bought for the British Museum in 1881 for £3000, and may be seen at the Natural History Museum, South Kensington.

**Humming-bird Moth.** See HAWK-MOTH.

**Hummocks.** See ICE; also FLORIDA.

**Humoral Pathology.** See MEDICINE.

**Humphrey, Duke.** See GLOUCESTER.

**Humus.** See SOILS.

**Hû-nan,** a province of China (q.v.).

**Hunchback.** See SPINE (DISEASES OF).

**Hundred,** in English law, an ancient subdivision of counties, the name of which probably arose from there being a hundred warriors, or perhaps a hundred families, or ten tithings, in each (see FEUDALISM). In ancient times, if a crime was committed, such as robbery, maiming of cattle, burning of stacks, &c., the hundred had to make it good. The old distinctions have, however, now less significance. But the characteristic of a hundred is still this, that it has a constable or bailiff, and when any damage is done by rioters feloniously destroying property the owner has his remedy by suing the hundred for the damage. In order to secure this remedy the party or his servant must, within seven days, go before a justice, and engage to prosecute the offenders, when apprehended. So, where there is no hundred, the county, or city, or town is liable in like manner. Execution is levied on the treasurer of the county. In the northern counties a hundred was called a wapentake (Yorkshire) or a ward. See RIOT, COUNTY.—The townships in Delaware, U.S., are also called Hundreds. See Professor G. E. Howard's *Introduction to the Local Constitutional History of the U.S.* (Baltimore, 1889). —*The Hundred Days* is a name often given to the period between Napoleon's landing in France after his escape from Elba (1st March 1815) and the battle of Waterloo (18th June 1815). See FRANCE, NAPOLEON I.

**Hungary** (Hung. *Magyarország*, Ger. *Ungarn*, Lat. *Hungaria*) is the eastern and larger half of the Austro-Hungarian monarchy, covering an area of about 125,000 sq. m., between 44° 10′ and 49° 35′ N. lat., and between 14° 25′ and 26° 25′ E. long. Comprising Hungary proper, Transylvania, Croatia and Slavonia (nominally also Dalmatia), and Fiume, it forms the realm of the crown of St Stephen or Transleithania, which is a coequal factor with Austria or Cisleithania in the empire-kingdom ruled over by the Hapsburg dynasty. The two states form a union under one monarch for military, diplomatic, and customs purposes, but otherwise retain their distinct independence of each other. The form of its government as well as its geographical, industrial, and statistical features having been dealt with in the article AUSTRIA, it now remains only to give an account of the history, language, and literature of the country, or its chief and ruling inhabitants, the Magyars.

*History.*—But little is known of the history of the Hungarians previous to their appearance in Europe in 884. They are generally believed to be the descendants of the Scythians, and to have come from regions about the Caspian Sea. They first settled along the Middle Volga, but, having been pressed westwards, they in 889 crossed the Carpathian Mountains under Almos, and under the further leadership of his son Arpád they conquered the ancient Pannonia and Dacia of the Romans; and this, their new country, was in the year 1000 formed into a regular kingdom by Stephen. For his merits in Christianising his people Stephen was afterwards created a saint, and received from Pope Sylvester II. the title of 'apostolic king' and a crown, both of which have been worn by all the kings of Hungary to the present day. The Hungarians were at first an extremely warlike and even savage tribe; and, not content with subduing the various nationalities inhabiting the ancient Roman provinces, they made frequent expeditions into Germany and Italy, destroying the early results of Christian civilisation. All this, however, ceased on, and even before, the accession of Stephen, who turned his attention solely to the consolidation of Christianity and interior order and prosperity. He laid the foundation of many institutions surviving to the present day, such as the ecclesiastical organisation, the archbishoprics and bishoprics, the municipal and county councils, and even the national council, which eventually developed into the Diet of the States. Within two decades after his death (1038) two attempts were made to overthrow Christianity, and to re-establish Paganism, but only with very slight and temporary success. Under Béla I. (1061-63), Ladislaus the Saint (1077-95), and Coloman the Learned (1095-1114), the country made very marked progress. The reign of Andrew II. is remarkable on account of the nobles having extorted from him in 1222 the 'Golden Bull,' or Hungarian Magna Charta, the privileges of which were in 1231 extended to the clergy and lower nobility. The 'Golden Bull' conferred many personal and material advantages on the nobles, and also contained a guarantee for the annual convocation of the diet; it conceded the right of armed resistance to any illegal acts of the king. During the reign of Béla IV. (1235-70) Hungary was devastated by a terrible Mongol invasion. To replace part of the population cruelly massacred by the Asiatic savages, Béla introduced German colonists; hence the German-speaking communities in Hungary to the present day. By the death of Andrew III. in 1301 the House of Arpád became extinct, and the throne of Hungary became an object of rivalry between various foreign potentates. After many vicissitudes, Hungary was fortunate enough to find a worthy king in the person of Charles Robert of Anjou (1308-42), who did much to place his adopted country on a level with more civilised western nations. His son, Louis the Great, made Hungary the most powerful nation of the period in central Europe. After the death of Ladislaus Posthumus (1457), Matthias Corvinus, the son of Hunyady, the great anti-Turkish hero and regent during that king's minority, was elected king. Under his reign Hungary attained to the pinnacle of fame, prosperity, civilisation, and power. He waged successful wars against Podiebrad of Bohemia, and got himself crowned king of Bohemia and Moravia. He also defeated the Turks at Kenyérmezö, and reconquered the southern provinces held by them. In 1485 he even took Vienna and made it the capital of his country, which was at that time more extended than ever before or after. But Matthias was not only a great general; he was also a great legislator, a munificent patron of art and sciences, and a great judge. His impartiality and love for the people were so generally recognised that to the present day there lives in Hungary the proverb: 'King Matthias is dead; there is no more justice.' Matthias having died without legitimate heirs, the throne of Hungary again became the object of fierce struggles between various pretenders, and the country underwent in consequence a period of rapid decay. Under Vladislaus (1490-1516) Hungary was the scene of a sanguinary peasant insurrection, known as the Dózsa revolt, which was ultimately suppressed, and led to a system of abject serfdom. Louis II.'s reign was still more disastrous. The Turks, under Soliman the Great, took advantage of the enfeebled condition of the country, invaded it with a gigantic army, annihilated the Hungarian forces at Mohács, pillaged whole districts, including Buda with the world-famous Bibliotheca Corvina, and carried off some 30,000 Hungarians as slaves. Louis II. himself lost his life in or after the battle of Mohács, and the Hungarian throne became once more the prize of contention between two claimants. One was John Zápolya, Woiwode of Transylvania, whom one section of the nobles proclaimed king, the other was Ferdinand of Austria, brother-in-law of Louis II. Zápolya was supported by the Turks, Ferdinand by the majority of the Hungarian nobles. Eventually Zápolya surrendered his claims to the whole kingdom, merely retaining Transylvania and the Transtisian district of Hungary for life. Thus the Hapsburgs obtained at length a final footing in Hungary, and the country entered on a period of endless suffering and humiliations.

The successors of Ferdinand—viz. Maximilian, Rudolph, Ferdinand II., Ferdinand III., and Leopold I.—when they were not engaged with the Turks, concentrated their energies on the suppression of Protestantism in Hungary. The Protestants won several victories over the Imperialists, as in 1604-6 under Stephen Bocskay, in 1620-21 under Bethlen Gabor, in 1644 under George Rákóczy, thus forcing the government to show more toleration towards the followers of the new religion; but the kings being under Jesuit influences, all treaties and promises were broken on the first opportunity. Especially ruinous was the long reign of Leopold I. (1657-1705), who, with the most merciless determination, used all means at his disposal, as he himself said, to 'impoverish, enslave, and recatholicise' Hungary. Some of his own highest office-holders, although themselves Catholics, so much resented his terrible treatment of the Protestants that they began a conspiracy for the separation of Hungary from the Hapsburg dominions; but the plot having been detected, the ringleaders were put to death. For many years the scaffolds were at work in suspected districts, and thousands of valiant families, mostly Protestants, were exterminated. A Protestant rising, under Count Emeric Tököly, and supported by Kara Mustapha, proved very successful in 1683, and very nearly led to the capture of Vienna and the utter destruction of Austria; but at the last moment John Sobieski, king of Poland, saved Vienna and the Hapsburgs. After the retreat of the Turks from Vienna they gradually lost their hold on Hungary.

Leopold died in 1705 amidst the anxieties entailed upon him by another Hungarian rising, led by a second Francis Rákóczy, which did not end before 1711. Leopold succeeded in causing the diet to declare the throne hereditary in the House of Hapsburg, and Charles VI. (1711-40) received their adhesion to the Pragmatic Sanction, securing the right of succession in the female line. Nevertheless, his daughter Maria Theresa's claim to the throne was called in question by several German rulers and by France, her dominions were invaded, and she saved them and herself only through the magnanimous self-sacrifice of the Hungarians. She was the first Hapsburg ruler who showed herself grateful to the Hungarians, and who proved herself to understand the duties of a sovereign. She made several concessions to the Protestants, improved the condition of the peasants, and established schools. Her son and successor, Joseph II. (1780-90), does not strictly figure among Hungarian kings, as he had never himself been crowned in Hungary, but carried on his reign in violation of the Hungarian constitution as an autocratic emperor. He was an enlightened reformer, but did not reckon with national feelings, class idiosyncrasies, interests, and prejudices; he attempted to make Hungary part of a vast pan-Germanic bureaucracy; and many of his measures fostered the discontent to such a degree that at his deathbed he saw himself compelled to recall all his illegal edicts, with the exception of one—viz. that enjoining religious toleration. Leopold II. at once convoked the diet (the first for twenty-five years), and confirmed the rights and independence of the nation. His conciliatory reign lasted only two years, and he was succeeded by Francis I. (1792-1835), whose ambition it was to follow the example of his least reputable predecessors. As long as the Napoleonic wars lasted, and the Hungarians supported him with money and troops, he played at constitutionalism; but as soon as the Napoleonic dangers were passed he showed himself in his true character, discontinued the diets and levied troops and taxes at his pleasure till 1825, when he was driven by the general discontent and resistance to convoke the states.

This diet marked the beginning of the new era in Hungary. The nation commenced to awaken to the consciousness of its many wants, intellectual and material; the desire for reforms was fast ripening. The majority of the delegates to the next diet (1832) were already bearers of radical instructions. The desired reforms, however, were slow in coming, owing to the narrow-minded policy of Metternich and the whole court party. The diet of 1832 counted among its members such men as Count Louis Batthányi, Baron Nicholas Wesselényi, Baron Joseph Eötvös, Francis Deák, and Louis Kossuth. The more important reforms passed by this and the subsequent diets of 1839 and 1843 were those regarding the official use of the Hungarian language, the eligibility of non-nobles to public offices, and the equal rights of Christian denominations. Outside parliament there was no less activity than inside. Kossuth's *Pesti Hirlap* (the first Hungarian political daily paper), which in enthusiastic language taught the masses how to demand their rights, rapidly spread all over the country. Kossuth advocated the abolition of serfdom, the equality of all citizens, the liability of nobles to taxation, and freedom of the press. He was returned to the diet of 1847 as senior member for the county of Pest, and it was on his motion that the House resolved in March 1848 to send a deputation to Vienna to demand all these and various other reforms. Ferdinand V., a weak-minded man, who had reigned since 1835, yielded after some hesitation, and the first Hungarian responsible ministry entrusted with the task of carrying the said measures was appointed. Count Louis Batthányi was prime-minister, Deák minister of justice, and Kossuth minister of finance. But the court party were secretly determined to frustrate all these reforms, which openly they did not dare to oppose. They therefore incited the Croatians and other non-Hungarian nationalities to rise against Hungarian supremacy. Accordingly Croatia, Slavonia, the Servian Bánát, and eventually the Roumans of Transylvania took up arms against Hungarian rule; and when the central government in Vienna was appealed to it issued highly-worded proclamations against the rebels, but gave very scant help to subdue them, whilst secretly it supplied them with arms, ammunition, and money. The Hungarian government, so treacherously abandoned, proceeded to obtain from parliament the vote of a levy of 200,000 men and 42 million florins of money, but to these measures, unanimously decreed by parliament, the crown withheld its assent. Later on, September 6, when a deputation of 120 members waited on Ferdinand to urge him to oppose the Croatian invasion, the court again gave an evasive reply. But a few days later, having received good news respecting the army operating in Italy, the court threw aside the hypocritical mask hitherto worn, and declared open hostility to Hungary by ignoring the existing constitution and government, recalling the Palatine Archduke Stephen, and appointing Count Lamberg governor-general and royal commissioner for Hungary. Parliament declared these acts illegal, and Count Lamberg was murdered on his arrival by the enraged population of Budapest. The ministry now resigned, and a committee of national defence was appointed with Kossuth as president. A comparatively numerous army was rapidly equipped and sent to meet Jellachich, who was marching towards Budapest at the head of the Croatians. He was completely beaten at Velencze, and during an armistice of three days, which was granted him by the victorious Hungarians, he fled ignominiously towards Vienna. Notwithstanding this defeat he was appointed commander-in-chief of all the forces and alter-ego of the emperor-king in Hungary; and all the decrees and resolutions of the Hungarian parliament were declared illegal.

On December 2 Ferdinand was compelled by a family council to abdicate in favour of his nephew, Francis-Joseph, who was then eighteen years of age. In his name the war began to be carried on bitterly against Hungary, all the more as the diet declared the succession unconstitutional. Up to the middle of January next fortune seemed to favour the Austrian arms; the Hungarians, though they fought valiantly and obtained some victories, had to retreat before the overwhelming numbers of the enemy; the whole trans-Danubian district and the north and south were lost to them; they had only the vast plains of the Alföld and Transylvania, where Bem entirely subdued the rebellious nationalities. Meanwhile the Russians were also coming to the aid of the Austrians, so that the Hungarians had fair reason to despair of their own position. It was only the inactivity of Windischgrätz, the new Austrian generalissimo, that saved the Hungarians. His aimless stay at Budapest gave Kossuth time to perambulate the country, and by his stirring eloquence and boundless energy to create a splendid though irregular army, which, under the various leadership of Dembinski, Vetter, Görgei, Klapka, and others, won so many victories over the Austrians within the next three months that by the end of April the country was almost entirely free from the enemy. The many defeats of the Austrian regular forces by the Hungarian irregulars so exasperated the Vienna court that, on March 4, 1849, it promulgated a decree abolishing the Hungarian constitution; to which the Hungarian diet replied by the declaration of independence, and the dethronement of the Hapsburg dynasty on April 14. No final form of government was decided upon, but Kossuth was temporarily elected governor-president, and instead of the committee of national defence a new ministry was formed under the presidency of Bartholomew Szemere. Had Görgei not disregarded Kossuth's advice, had he forced his way to Vienna after so many victories, the whole war might have come to an end with glorious results for Hungary; but Görgei decided to first retake Budapest, and thereby enabled the united Russian and Austrian armies to invade the country at various points. These combined armies consisted of no less than 275,000 men, with 600 batteries, whilst the Hungarians numbered barely 135,000, with no artillery to speak of. In these circumstances the Hungarians had little chance of defending themselves with any measure of success, but they continued to fight with the greatest determination. Fortune still smiled on them here and there, but on the whole chances and events were against them. This decline of their fortunes was aggravated by the serious dissensions between Görgei and Kossuth, which grew daily in intensity till the latter thought it advisable, in order not to hamper the other's strategic activity, to abdicate in favour of Görgei on August 11, 1849. Once in the possession of the chief political and military power, Görgei no longer thought of continuing the struggle, but immediately and unconditionally surrendered himself to the Russians. This act on his part was defended by him as one imposed by necessity and a saving of further bloodshed; but examined in the light of his former conduct and of the fact that he induced, by empty and futile promises for the safety of their persons and their troops, thirteen other generals to follow his example, it is generally considered by the majority of his countrymen an act of unpardonable treason. Kossuth and several other military and political leaders fled to Turkey, whilst the others who remained behind and were captured were either sentenced to long terms of imprisonment or shot and hanged like mere criminals. Among the latter were Count Louis Batthányi and the thirteen generals betrayed by Görgei, including Count Charles Leiningen, a relative of the Queen of England. Görgei himself was sent to Klagenfurt, and kept there on a small pension. Hungary was incorporated into and governed as an hereditary province of Austria, the governor being General Haynau, who wielded his official power with extraordinary harshness and cruelty. Political prisoners were tortured, women publicly flogged, properties and rights confiscated. With the exception of the abolition of serfdom all the acts of the diet of 1848 were annulled, and Hungary was governed by a host of foreign officials according to Austrian laws and institutions. The country displayed no active resistance, nevertheless all the efforts of this centralising and Germanising system so completely failed that by 1857 the Vienna government began to see its futility and to offer some concessions.

After the disastrous Italian war in 1859 the old Hungarian chancellory, as it existed previous to 1848, was re-established, but failed to satisfy the Hungarians, whose passive resistance threatened with a final breakdown the Austrian state machinery. At length in 1861 the diet was once more convoked; but, as it demanded the full restitution of the constitution of 1848, it was quickly dissolved. Gradually, however, better counsels prevailed at the court of Vienna. Parliament was again summoned in 1865, and the demands of the Hungarians, as formulated by Deák and his party, were complied with, and resulted in the agreement described in detail in the article AUSTRIA. Francis-Joseph was crowned king of Hungary, June 7, 1867, and entered on the faithful discharge of his duties as constitutional monarch. There is still a numerous party in Hungary in favour of complete separation from Austria, but none are hostile to the sovereign. Whether an agreement consisting partly of contracts made for perpetuity and partly of treaties renewable every ten years will continue to work so well with the growth of the aspirations of the several nationalities is by no means certain. Hungary made good use of the period of internal peace enjoyed after the coronation, and made rapid strides in the path of civilisation. It established an admirable system of elementary and higher education, built a magnificent net of railways (now largely in the hands of the state), improved its judicature, developed commerce and industry, and organised, in addition to the Austro-Hungarian common army, an effective system of national defence, the Honvéds. Budapest, its capital, equalled by few, surpassed by none among the great cities of Europe, is watched with as much envy by the Austrians as the growing influence of the Hungarians in the common councils of the monarchy. Lately the former heavy deficits have disappeared from the budget, and there is every hope of the kingdom soon being in a condition to reduce its heavy debts. The various nationalities in Hungary (Servians, Wallachs, Ruthens, Slovaks, Germans) enjoy the same rights as the native Magyars, which are considerably greater than in Austria; there is therefore comparatively little discontent prevailing among them, even though panslavistic missionaries do their best to stir it up among the northern races. Much of Hungary's steady progress is due to the fact that since the new era there have been few changes in its government, that of M. Tisza continuing in office for fifteen years (March 1875—March 1890).

*Language and Literature.*—The Hungarians when they settled in their present land a thousand years ago brought their language ready with them, and this, although it has had since to borrow certain words from European languages to convey new ideas, has retained all its original features both as regards etymology and syntax. The origin of the Hungarian language can hardly be stated yet with certainty. Hungarian philologists are divided into two sections on the point, the 'Orientalists' maintaining its affinity with Turco-Tartaric languages, whilst the 'Finnists' contend, and for the present at least with far more general success, that it belongs to the Ugric branch of the Finnish group. By reason of the perfect harmony between vowels and consonants, and the very distinct articulation and pronunciation essential to it, Hungarian is considered a very musical language, particularly adapted to poetry and rhetoric. Its grammar, moreover, is so strikingly different from that of any other European language, and so rich in original characteristics, that it offers a very interesting field to students of comparative philology. It is acknowledged by them that it is well adapted to express ideas with the utmost clearness, owing to the distinctness and immense variety of endings and the originality and flexibility of its roots. Among its characteristics are that it has no genders, and *declination* and *conjugation* are effected by means of suffixes only; that the verbs possess objective and subjective forms (e.g. *látok*, 'I see;' *látom*, 'I see him or her or it;' *látsz*, 'thou seest;' *látod*, 'thou seest him or her or it,' &c.); that it invariably places the surname before the Christian name. It is also noteworthy that there are absolutely no dialects in the Hungarian language, and scarcely any difference of pronunciation in the various parts of the country.

From the date of the establishment of the Hungarian kingdom the use of the Hungarian language was so much restricted that a Hungarian literature can hardly be said to have existed before the close of the 18th century. The introduction of Christianity by Italian and German priests in the 11th century made Latin the official language and the medium of intercourse between the educated classes, and this remained so to a great, though gradually diminishing, extent up to the third and fourth decade of the 19th century. There was a slight reaction in favour of Hungarian after the Reformation, but the language was not taught in schools till the year 1790, and parliament did not discontinue Latin until 1825. The oldest Hungarian literary record extant is a funeral oration dating from the year 1171; there are also some religious songs and dramatic 'mysteries' from the 14th century. The first lay poet of real merit, Baron Valentine Balassa, lived in the second half of the 16th, the first great epic poet, Zrinyi, in the 17th century.

The revival of literature began to take place only towards the end of Maria Theresa's reign. Lyric poetry was cultivated by Anyos, Virág, Bacsányi, and by Alexander Kisfaludy (1772 1844), Daniel Berzsenyi (1776–1836), Francis Kazinczy (1759-1831), and others, who not only added to the valuable stock of literature, but also enriched the language with new words and forms—Kazinczy excelling so much in this respect as to obtain the appellation of 'the recreator of the language.' Kolcsey, orator, essayist, and poet, and Charles Kisfaludy (1788–1830), the founder of Hungarian drama, were the chief literary figures at the beginning of the 19th century. Hungarian poetry, however, cannot be said to have possessed much originality at this period; it was reserved to such men as Petöfi (1823–49), Vörösmarty (1800 55), Arany (1817–82), and Tompa (1819-68) to regenerate Hungarian poetry on national lines. This end was attained towards the period of the war of independence, since which Hungary has produced a number of minor poets, such as Sárosy, Szász, Vajda, Kiss, Reviczky, Abrányi, and Rudnyánszky. In dramatic literature Charles Kisfaludy was followed by Szigligeti (1814 78), whose extreme fertility enriched it by many exceedingly successful plays. The classic tragedy *Bank Bán* of Katona (1792–1830), and *The Human Tragedy*, a dramatic poem, by Madách (1823-64), on the lines of Goethe's *Faust*, but no less original, deserve especial mention. Amongst their successors there is only one great dramatist Gregor Csiky. The Hungarian theatres rely mainly on products of foreign literature—French, English and German.

In prose literature Hungary has produced many standard works. The founder of the real Hungarian novel was Baron Nicholas Josika (1794 1865), whose historical and social novels on the model of Sir Walter Scott's works achieved great success and popularity. Baron Joseph Eotvös (1813–71) cultivated the sentimental novel, and the novel with a purpose. But among authors of fiction the highest rank is due to Maurice Jókai (q.v.), whose boundless imagination and profound humour have rendered him a favourite with readers in many countries beyond his own. Almost all his novels have been translated into German, many into Italian, French, English, and other languages. Beyond its own original productions it also possesses admirable translations of all the masterpieces in the world's literature, from the Bible, of which it possesses three versions, down through all ages and countries to Tennyson's poems. A collection of Shakespeare's plays is especially noteworthy, they having been translated by Hungary's greatest poets, including Petöfi (*Coriolanus*), Arany (*Hamlet*, *Midsummer-Night's Dream*, *King John*), Vörösmarty (*King Lear*), and others. It should be added that the best literary talent of the country is to a great extent connected with journalism.

See Fessler, *Geschichte der Ungarn* (new ed. by Klein, 1863-87); Majláth, *Geschichte der Magyaren* (2d ed. 1853); Sayous, *Histoire des Hongrois* (Par. 1876), and works by Horváth, Szalay, Toldy, &c.; also Vambéry, *Story of Hungary* (1886), and Léger, *History of Austro-Hungary* (trans. by Mrs Birkbeck Hill, with preface by Freeman, 1890).

**Hunger.** See APPETITE, DIGESTION.

**Hungerford,** a town of Berkshire, partly also in Wiltshire, is situated on the river Kennet, 26 miles WSW. of Reading. It is a hunting centre, and a favourite resort of anglers, having been even in Evelyn's time 'a towne famous for its troutes.' In the town-hall (1870) is preserved a horn gifted to the town by John of Gaunt in 1362. Pop. 2965.

**Hüningen** (Fr. *Huningue*), a town of Alsace, on the left bank of the Rhine, 2¼ miles N. of Basel, is celebrated for its fish-breeding establishment (see PISCICULTURE). It was fortified by Vauban in 1679-81, but the works were finally destroyed in 1815. Pop. 1704.

**Huns** (Lat. *Hunni*, Gr. *Ounnoi* and *Chounoi*), a nomad race of antiquity, whose remote ancestors were probably the Hiung-nu, a people of Turkish stock, who formed a powerful state in Mongolia in the 2d century B.C. In 177 they conquered another large nomad race, the Yue-chi, akin to the Tibetans, and drove them westward and southward, they themselves following. But about the dawn of the Christian era their political power fell to pieces and the tribesmen were scattered. One section, however, seems to have fled westwards and to have settled in the neighbourhood of the river Ural and the Volga. At all events, some three centuries and a half later the people known to classic and medieval writers as Huns stepped upon the stage of history from that part of the world. About the year 372 they moved westwards again, under a leader called Balamir, and subdued first the Alani, who dwelt between the Volga and the Don, and then proceeded to attack the Ostrogoths, part of whom submitted somewhat tamely, whilst another part offered strenuous opposition, but were in the end compelled to submit likewise. This business completed, the Huns next invaded the territories of the Visigoths, and drove this people before them across the Danube, except one section, who, under Frithigern, sought permission of Valens, emperor of the East, to settle in his territories. The districts quitted by the Goths were occupied by the Huns. This, their first wave of invasion and conquest, seems then to have subsided; and, though it was followed by more than one smaller after-wave, it was not until about 430 that the second and greater wave began to gather head again in Rhuas or Rugulas. This chief acquired such power and influence that in 432 he imposed upon Theodosius II., emperor of Byzantium, an annual tribute of 350 pounds of gold. He was succeeded in 433 by his more illustrious nephew Attila (q.v.). With Attila's death, however, in 453, the power of the Huns crumbled to pieces amid the intestine strifes of his sons and generals, and the attacks of their foes round about. After a most disastrous defeat inflicted upon them in Pannonia in 454 by the combined armies of the Goths, Gepidæ, Suevi, Herulians, and others, the tribesmen of the Huns rapidly dispersed. Some settled in the Dobrudja, others in Dacia, whilst the main body seem to have returned to the land from whence they came—viz. the region about the river Ural. Some authorities identify these with the later Bulgarians, who about the end of the 5th century had risen into a powerful state on the Volga, and sent off conquering bands to the south-west, who finally settled in the modern Bulgaria.

The Huns are described as being of a dark complexion, deformed in appearance, of uncouth gesture and shrill voice. 'They were distinguished,' says Gibbon, 'from the rest of the human species by their broad shoulders, flat noses, and small black eyes deeply buried in the head; and, as they were almost destitute of beards, they never enjoyed either the manly graces of youth or the venerable aspect of age. A fabulous origin was assigned worthy of their form and manners—that the witches of Scythia, who for their foul and deadly practices had been driven from society, had united in the desert with infernal spirits, and that the Huns were the offspring of this execrable conjunction.' Like the Mongols, they were essentially a race of horsemen; they fought with javelins tipped with bone, with sabres, and with slings or lassoes. They ate herbs and half-raw meat, which they first used as saddles; and they clothed themselves with the skins of wild animals.

The White Huns or Ephthalites or Hephthalites are by some regarded as a branch of the Hiung-nu, though others make them the descendants of the ancient Royal Scythians, identifying them with the Barsileens, the allies of the Khazars. Whatever be their real origin, they were certainly established in ancient Bactria and the adjoining districts, between the Oxus and the Caspian, at a period contemporaneous with Attila's career. From the third decade of the 5th century onwards for about 120 years they were engaged in constant wars with their neighbours on the south, the Persians. In 484 the Ephthalites routed them in a fierce battle, in which Peroz, king of Persia, was amongst the slain. But their power seems to have been finally broken about 560 by the all-conquering Turks on their way to Asia Minor and Constantinople.

See De Guignes, *Histoire Générale des Huns* (vol. i. 1756); Neumann, *Die Volker des südlichen Russland* (2d ed. 1855); Thierry, *Histoire d'Attila* (4th ed. 1874); and Howorth, in *Jour. Anthropol. Inst.* (1872-74).

**Hunstanton,** a watering-place of Norfolk, on the Wash, 18 miles NE. of King's Lynn by a railway (1862). It has a broad beach of firm sand, and good bathing and sea-fishing, a pier, and a splendid Decorated church (*c.* 1330). Hunstanton Hall, dating from the Tudor period, but greatly injured by fire in 1853, was the seat of Sir Roger L'Estrange. A lighthouse (1840) lifts a fixed light to an altitude of 109 feet, and shows it for a distance of 16 miles. Pop., with Barrett Ringstead, 1516.

**Hunt,** HENRY, surnamed 'Orator Hunt,' was born at Upavon, in Wiltshire, on 6th November 1773. He was a well-to-do farmer, but in 1801 his hot temper embroiled him with Lord Bruce, the commandant of the Wiltshire yeomanry, which brought him six weeks' imprisonment. He came out of gaol a hot Radical, and spent the rest of his life travelling about the country addressing the people on behalf of the repeal of the Corn Laws and as an advocate of parliamentary reform. In 1819, on the occasion of the Peterloo massacre, he delivered a speech, which cost him three years' imprisonment. He died at Alresford, in Hampshire, on 13th February 1835.

**Hunt,** James Henry Leigh, poet and essayist, was born at Southgate, near Edmonton, on 19th October 1784. His father, Isaac Hunt (1752–1809), a Barbadian, being driven by the Revolution from Philadelphia to London, gave up law for the church, but lapsed into bankruptcy and Universalism. Leigh Hunt spent eight years at Christ's Hospital, and left at fifteen as first 'Deputy-Grecian,' debarred by a stammer from further promotion. He was a clerk first under one brother, an attorney, and next for four years in the War Office, writing meanwhile much dramatic criticism; in 1808 with another brother, a printer, he set up the *Examiner;* and in 1809 wedded Marianne Kent (1788-1857). The *Examiner's* tone was Radical, and, after several government prosecutions in 1813 for a libel on the Prince Regent (he had called him a 'corpulent Adonis of fifty'), Leigh Hunt was sentenced to a fine of £500 and to two years' imprisonment in Surrey gaol. There he 'scattered urbanity,' played battledore with his children, received hosts of visitors, and turned his cage into a 'bower of roses.' In November 1821 with his wife and seven children he sailed for Italy, but landed at Leghorn only on 1st July. He went on Shelley's invitation to help him and Byron to found the quarterly *Liberal.* Just a week later Shelley was drowned; Leigh Hunt and 'my noble friend' failed somehow to pull together; the *Liberal* died in its fourth number; and by 1825 the family was back at Highgate. Changes of residence, to Upper Cheyne Row, Chelsea, in 1833, to the 'old court suburb' of Kensington in 1840, and to Hammersmith in 1853—these are thenceforth the chief events in Leigh Hunt's life. It was one of ceaseless activity and as ceaseless embarrassment, for he '*never* knew his multiplication table.' From 1844, however, Sir Percy Shelley allowed him £120 a year, and in 1847 he received a pension of £200. He died on a visit to Putney, 28th August 1859.

The 'Cockney poets,' so the critics dubbed Keats and Leigh Hunt. That the two should ever thus have been bracketed may now seem strange, for Leigh Hunt's poetry now is little known. And yet it is better than much, maybe most, of the newer poetic vogues. Its charm lies in a prettiness as of childhood; its wit and cleverness and wine-like sparkle have ever a smack of precocity. Narrative verse is his forte, his foible jauntiness. His translations are among the choicest of their kind; he transports the southern vintages to England, and their colour and flavour improve instead of losing by the voyage. As his poems, so his prose; his essays are always worth reading, but only after the *Essays of Elia.* Leigh Hunt's writings, indeed, are less memorable than his friendships—with Keats and Shelley, as also with Lamb, Byron, Moore, Coleridge, Dickens, Carlyle, and a whole galaxy of lesser luminaries. Our knowledge of them, and especially the first two, is largely derived from his.

In his excellent *List of the Writings of Hazlitt and Leigh Hunt* (1868) Mr Alexander Ireland chronologically arranges with notes, &c., seventy-nine works by the latter, including *Juvenilia* (1801), *The Feast of the Poets* (1814), *The Story of Rimini* (1816), *Foliage* (1818), *Captain Sword and Captain Pen* (1835), and *The Palfrey* (1842); besides much in prose, as *Lord Byron and his Contemporaries* (1828), *Sir Ralph Esher* (1832), *Imagination and Fancy* (1844), *Wit and Humour* (1846), *Stories of the Italian Poets* (1846), *A Jar of Honey from Mount Hybla* (1848), and *The Old Court Suburb* (1855). See Leigh Hunt's *Autobiography* (3 vols. 1850; revised ed. 1860) and *Correspondence* (2 vols. 1862), Forster's *Life of Dickens* (for the unkindly 'Horace Skimpole' episode), a capital article in the *Cornhill* (i. 1860), and one by Professor Dowden in Ward's *English Poets* (iv. 1880).

**Hunt,** Thomas Sterry, an American chemist and geologist, born at Norwich, Connecticut, 5th September 1826, was for a period assistant to the elder Silliman at Yale College, and from 1817 to 1872 was chemist and mineralogist to the Canadian Geological Survey. He was also professor of Chemistry at Laval University (1856-62) and at M'Gill University (1862-68); from 1872 to 1878 he held the chair of Geology in the Massachusetts Institute of Technology. In 1848-51 he contributed a series of papers on theoretical chemistry to the *American Journal of Science;* in organic chemistry his name is identified with a system essentially his own. His researches into the composition of rocks have been of great importance. In 1859 he invented the green ink with which Greenbacks (q.v.) are printed. Professor Hunt was made an officer of the Legion of Honour in 1867, and has received numerous other distinctions, including a fellowship of the Royal Society (1859), and the degree of LL.D. from Cambridge (1881). He has published over 200 papers and several larger works on chemistry and mineralogy.

**Hunt,** William Henry, English painter in water-colours, was born in London, March 28, 1790. He was one of the creators of the English school of water-colour painting, Mr Ruskin pronouncing him to be among the greatest colourists of the school. His subjects are very simple—'Peaches and Grapes,' 'Old Pollard,' 'Basket of Plums,' 'Roses,' 'Wild Flowers,' 'Trampers at Home,' 'A Farmhouse Beauty,' 'Fast Asleep,' &c., but they are conceived in a finely poetical spirit, and present the perfection of finish. He died 10th February 1864.

**Hunt,** William Holman, painter, was born in London in April 1827. In his early years he was engaged in business, but in 1815 he was admitted a student of the Royal Academy. In the following year he exhibited his first picture, 'Hark!' a child holding a watch to her ear; this was followed by scenes from Dickens and Scott, and by the more important '*Flight of Madeline* and Porphyro,' from Keats' *Eve of St Agnes* (1848). At this period Mr Hunt shared a studio with Dante Gabriel Rossetti, and the pair, along with Millais and a few other earnest young painters, inaugurated the 'Pre-Raphaelite Brotherhood,' of which the members aimed at detailed and uncompromising truth to nature in their rendering of visible things, and at a vivid and unconventional realisation in their treatment of imaginative subjects. In 1850 Mr Hunt contributed to *The Germ*, the short-lived magazine of the brotherhood, two etched subjects illustrating Woolner's poem 'My beautiful Lady,' and at a later period he designed various woodcuts, in particular a remarkable series for the illustrated Tennyson of 1857. The first of the painter's works executed in the Pre-Raphaelite manner was 'Rienzi vowing to avenge the Death of his Brother' (1849), in which the principal figure was painted from Rossetti. It was followed by 'A Converted British Family sheltering a Christian Missionary from the Pursuit of the Druids' (1850); 'Valentine rescuing Sylvia from Proteus,' from the *Two Gentlemen of Verona* (1851); 'The Hireling Shepherd' (1852); and 'Claudio and Isabella,' a tragic and impressive prison-scene from *Measure for Measure* (1853) works very fresh and original in conception, and carried out with the most careful elaboration; while 'Our English Coasts,' known also as 'The

Strayed Sheep' (1853), was a remarkable effort in landscape art, realising with exceptional power an effect of vivid sunlight, and combining in a wonderful manner detail and definition with a sense of distance and atmosphere. 'The Light of the World' (1852–54), of which a smaller replica was executed in 1856, ranks as one of the most impressive symbolical works of the century; it is now in the chapel of Keble College, Oxford. 'The Awakened Conscience' aimed to point a moral by means of a scene from modern life. On the completion of the last-named picture in the beginning of 1854 Mr Hunt started for Palestine, with the intention of studying eastern life, and realising the incidents of the biblical history with the closest possible accuracy to local colouring and the surroundings amid which they occurred. The result of several prolonged visits to the East appeared in 'The Scapegoat' (1854); 'The Finding of Christ in the Temple' (1854)—of which a smaller version was painted in 1860; 'The Shadow of Death' (1874), now in the Corporation Gallery, Manchester; and 'The Triumph of the Innocents' (1875–85), executed in two versions; while the passionate and splendidly-coloured 'Isabella and the Pot of Basil' was the result of a visit to Florence in 1867. In 1881 he painted a portrait of Professor Sir Richard Owen, and in 1888–89 'The Choristers of Magdalen College, Oxford, singing the May Day Hymn.' A collection of over thirty of his works was exhibited in the Fine Arts Society's rooms, London, in 1886; and in the same year he contributed to the *Contemporary Review* a series of autobiographical papers.

**Hunter,** JOHN, physiologist and surgeon, was born at Long Calderwood, near East Kilbride, in Lanarkshire, 13th February 1728, and was the youngest of ten children. One of his sisters, Dorothea, was married to Dr James Baillie, professor of Divinity in the university of Glasgow, and was the mother of Matthew and Joanna Baillie (q.v.). His brother William's fame led John to apply for and obtain the situation of assistant in the dissecting-room. He studied surgery under Cheselden in 1749–50 at Chelsea Hospital, and subsequently under Pott. After a year at Oxford he entered St George's Hospital as surgeon's pupil in 1754, afterwards becoming house-surgeon and partner with his brother in the anatomical school. After ten years' hard work of this kind his health gave way, and in 1759 he entered the army as staff-surgeon, and served at Belleisle and in the Peninsula. Peace being proclaimed in 1763, he returned to London and, starting the practice of surgery, devoted much time and money to comparative anatomy. In 1767 he was elected a Fellow of the Royal Society, and in the following year was appointed surgeon to St George's Hospital, an appointment which enabled him to take pupils, of whom one of the earliest was Jenner. His practice at this time was increasing rapidly, but his income never reached £1000 a year until 1774. In 1776 he was appointed surgeon-extraordinary to the king. In 1785 he built his museum, with lecture-rooms, and in the same year he tried his famous operation for the cure of aneurism—that of simply tying the artery at a distance from the tumour, and between it and the heart. In 1786 Hunter was appointed deputy-surgeon-general to the army; in 1787 he received the Copley medal from the Royal Society. He was now universally acknowledged by all the younger surgeons as the head of his profession; but most of his contemporaries looked upon him as little better than an innovator and an enthusiast. He died 16th October 1793, and was buried in the church of St Martin's-in-the-Fields, whence, thanks to Frank Buckland, his remains were translated in March 1859 to Westminster Abbey. Some idea of Hunter's diligence may be gathered from the fact that his museum contained at the time of his death 10,563 specimens and preparations illustrative of human and comparative anatomy, physiology, pathology, and natural history. He died in comparative poverty, and his collection was purchased by government, two years after his death, for £15,000, and was presented to the Royal College of Surgeons.

In addition to the numerous papers contributed to the *Transactions* of the Royal and other learned societies, he published the following independent works: *The Natural History of the Human Teeth* (1771–78); *A Treatise on the Venereal Disease* (1786); *Observations on Certain Parts of the Animal Economy* (1786); and *A Treatise on the Blood, Inflammation, and Gunshot Wounds* (1794). See the edition of his works by Palmer (1835), with prefixed Life by Otley.

**Hunter,** WILLIAM, anatomist and obstetrician, an elder brother of John Hunter, was born at Long Calderwood, Lanarkshire, 23d May 1718. Originally educated for the church at Glasgow University, he studied medicine for one session (1740–41) at Edinburgh, and then proceeded to London, where he went through a long training in anatomy at St George's Hospital and elsewhere. In 1747 he was admitted a member of the Corporation of Surgeons, ultimately confining his practice to midwifery. In 1762 Hunter was consulted by Queen Charlotte, and two years later was appointed physician-extraordinary to her majesty. Elected a Fellow of the Royal Society, he in 1768 became professor of Anatomy to the Royal Academy. In 1770 he removed to Great Windmill Street, where he had built a house, in connection with which were an amphitheatre for lectures, a dissecting-room, and a museum which contained not only his anatomical preparations, but many objects of natural history and a cabinet of very rare medals and coins. Hunter and his brother John were for many years estranged, owing to a dispute as to the priority of certain discoveries; but the quarrel was made up while William was on his death-bed. He died 30th March 1783. His museum was bequeathed to his brother-in-law, Dr Baillie, and after him, with an endowment of £8000, to Glasgow University (q.v.). His most important work, *An Anatomical Description of the Human Gravid Uterus and its Contents*, did not appear in its complete form till after his death.

**Hunter,** SIR WILLIAM WILSON, statistician, was born on 15th July 1840, educated at the universities of Glasgow, Paris, and Bonn, and in 1862 entered the civil service of India. His first important office, that of superintendent of public instruction in Orissa (1866–69), gave him the opportunity to write *Annals of Rural Bengal* (1868) and *Comparative Dictionary of the Non-Aryan Languages of India and High Asia* (1868). Then, after filling the responsible offices of secretary to the government of Bengal and the supreme government of India, he was in 1871 appointed director-general of the statistical department of India. The Indian census of 1872 was his first work in his new position. His later books include the compendious *Imperial Gazetteer of India* (9 vols. 1881; 14 vols. 1886–88), *Orissa* (1872), *Life of Lord Mayo* (2d ed. 1876), *Statistical Account of Assam* (1880), *Famine Aspects of Bengal Districts* (1874), *Indian Mussulmans* (1871; 3d ed. 1876), *The Indian Empire: its People, History and Products* (2d ed. 1886). He was one of the first recipients of the order of the Star of India, in 1878, and in 1887 was knighted. In 1890 he undertook the editorship of a series, 'Rulers of India,' to which he himself contributed the opening volume, a *Life of Dalhousie*.

**Hunting.** See FOXHUNTING, STAG, and the articles on the other animals hunted.

**Huntingdon,** SELINA, COUNTESS OF, was the second of three daughters and co-heiresses of Washington Shirley, *second Earl Ferrers, and was born* August 24, 1707. She married the Earl of Huntingdon in 1728, and became a widow in 1746. Adopting the principles of the Calvinistic Methodists, the founder of which sect was the famous George Whitefield, she made that eminent preacher one of her chaplains, and assumed a leadership among his followers, who came to be known as 'The Countess of Huntingdon's Connection.' *Her* labours at home increased with her years. For the education of ministers she established and maintained a college at Trevecca, in Brecknockshire (removed in 1792 to Cheshunt, Herts); and built, or became possessed of, numerous chapels in different parts of the country, the principal one being at Bath. She died June 17, 1791. By her will, dated January 11, 1790, she created a trust, bequeathing her chapels, then sixty-four in number, to the care of four persons. Most of them have become, in doctrine and practice, almost identical with the Congregational churches.

**Huntingdon,** the county town of Huntingdonshire, on the left bank of the Ouse, and the Ermine Street of the Romans, 59 miles N. of London. It became the seat of a royal castle in 917, and was incorporated in 1189. It has breweries, brickworks, carriage-works, and nursery gardens. Here Oliver Cromwell was born (1599), and here the poet Cowper lived for a couple of years (1765–67); the chronicler, Henry of Huntingdon (*q.v.*), was Archdeacon of Huntingdon. With the municipal borough of Godmanchester (pop. 2188), on the opposite bank, it formed a parliamentary borough, returning till 1867 two members, till 1885 one. Pop. (1851) 3882; (1881) 4228.

**Huntingdonshire,** an inland county of England, 30 miles long, and 23 broad, is bounded on the N. and W. by Northampton, Cambridge, and Bedford shires. Area, 359 *sq. m.*, *almost the* whole of which is arable or in pasture. Pop. (1801) 37,568; (1861) 64,250; (1881) 59,491. Huntingdonshire has no hill-ranges *of any* importance, and is watered chiefly by the Nene, which forms its northern boundary, and the Ouse; in the fen-district in the north-eastern part of the county, forming part of the Bedford Level (q.v.), there were formerly some large lakes or meres, notably Whittlesea, Ramsey, and Ugg; but these have been drained and reclaimed for cultivation. The soil consists principally of clay, with, in places, sand, gravel, and peat earth, the latter being almost wholly confined to the fen-district. Huntingdonshire comprises four hundreds and the municipal boroughs of Huntingdon, Godmanchester, and St Ives, with part of the city of Peterborough, the greater portion of which is however *in* Northamptonshire. It contains 103 parishes, is almost entirely in the diocese of Ely and the South-eastern Circuit, and returns two members *to* parliament. A peculiarity in its civil government is that it is included under the same shrievalty with Cambridgeshire, the sheriff being annually chosen in rotation from the county of Cambridge, the Isle of Ely, and this county. Of its earlier inhabitants Huntingdonshire has numerous traces; two Roman roads traverse it; at Alwalton, Earith, and Chesterton are remains of camps, the construction of which is also ascribed to the Romans; and in *many* places Roman remains, as pottery, coins, &c., have been found. Among places of interest in the county those most worthy of mention are the ruins of Ramsey Abbey and Buckden Palace, the latter being formerly the residence of the bishops of Lincoln; Hinchinbrook House, anciently the seat of the Cromwell family Kimbolton Castle, the seat of the Duke of Manchester, where Queen Catharine resided for some time after her divorce from Henry VIII.; Horeham Hall, the residence of the Princess Elizabeth during the reign of her sister Mary; Denton, the birthplace of Cotton the antiquary; Little Gidding the seat of Nicholas Ferrar's community; and Brampton, where lived for some years Samue Pepys.

**Huntly,** a town of Scotland, 41 miles NW. of Aberdeen. In the vicinity is the ruin of Huntly Castle, the seat of the earls and marquises of Huntly (see GORDON). Huntly is the birthplace of Dr George Macdonald. Pop. 3519.

**Huntsville,** capital of Madison county, Alabama, in the valley of the Tennessee, 10 miles N. of the river, and 212 miles ESE. of Memphis by rail. It has an ice-factory, a foundry, and manufactures of cotton, cotton-seed oil, and flour. Pop. 4977.

**Hunyady Janos.** John Corvinus Hunyady, governor of Hungary, one of the greatest war-captains of his age, was born towards the close *of the 14th century. His origin is wrapped in* mystery, the current legend being that he was a son of the Emperor Sigismund by a Wallachian lady. *His* life may be succinctly described as one unbroken crusade against the Turks. During the period 1437–56 he was the shield of Hungary, not only against external foes, but against the lawlessness of the nobles at home. The principal moments in his celebrated contest with the foes of Christendom are his expulsion of them from Transylvania in 1442; his brilliant campaign south of the Danube in 1443; his defeat in the bloody battle of Varna, 1444; and that at Kossovo in 1448; but his most glorious achievement was the storming of Belgrade (1456). Shortly afterwards Hunyady died of dysentery. During the minority of Ladislaus V. the great captain acted as governor of the kingdom (1445–53). Hunyady left two sons, Ladislaus and Matthias—the former of whom was beheaded at Buda on a charge of conspiracy by Ladislaus V.; the latter succeeded to the crown of Hungary (q.v.).

**Huon Gulf,** an inlet on the east side of New Guinea, in Kaiser Wilhelm's Land. It contains some good harbours, and receives two or three fairly large rivers. See NEW GUINEA.

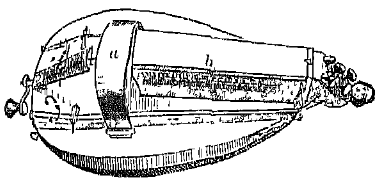
**Huon of Bordeaux,** one of the cycle of romances grouped together round the name of Charlemagne. In its present form it is a *prose* version, dating from 1454, of a poem current about *the end of the 12th century, and sometimes ascribed,* without grounds, to the trouvère Huon de Villeneuve. In the story, Huon, Duke of Guienne, one of the paladins of Charlemagne, in self-defence kills Charlot, son of Charlemagne, and is *in con*sequence condemned to die, but his life is granted on the hard condition that he brings back from Bagdad some of the Saracen emir's teeth and beard after having kissed his daughter before his face. The dwarf Oberon gives him *a magical cup and* horn, one blast of *which in the hour of* peril brings him and 100,000 warriors to Huon's aid. Moreover, the princess Esclarmonde, like Medea, lightens his labours by falling in love with him, so that at last he is completely successful, and returns with her as his wife to clear himself before Charlemagne. The prose romance was printed at Paris in 1516; and Lord Berner's English translation, by Wynkyn de Worde, in 1534 (edited by S. L. Lee for Early Eng. Text Soc., 4 parts, 1882 87).

**Hû-pei,** *one of the central* provinces of China, watered by the Yangtse. See CHINA.

**Hurd,** RICHARD, English prelate and writer, named the 'Beauty of Holiness' on account of his comeliness and piety, was born at Congreve, in Staffordshire, January 13, 1720, and studied at Emmanuel College, Cambridge, of which he became a Fellow in 1742. In 1749 appeared his first notable production, *Commentary on Horace's Ars Poetica*. In connection with this work Gibbon wrote of the author, 'I know few writers more deserving of the great but prostituted name of critic; but, like many critics, he is better qualified to instruct than to execute.' In 1750, on the recommendation of Warburton, of whom he was a life-long friend and admirer, and whose *Works* he edited in 1788, he was appointed one of the Whitehall preachers. He afterwards (1774) became Bishop of Lichfield and Coventry, but exchanged this see for Worcester in 1781; in 1783 he declined the archbishopric of Canterbury. He died May 28, 1808. His principal works are *Dissertations on Poetry, &c.* (1755-57); *Dialogues on Sincerity, Retirement, the Golden Age of Elizabeth, and the Constitution of the English Government* (1759), his most popular book; *Letters on Chivalry and Romance* (1762); *Dialogues on the Uses of Foreign Travel* (1764); and *An Introduction to the Study of the Prophecies concerning the Christian Church* (1772). See Hurd's *Works* (8 vols. 1811) and *Memoirs* by Kilvert (1860).

**Hurdwár.** See HARDWÁR.

**Hurdy-gurdy,** a very old musical instrument of the stringed kind, something between a guitar and a lute in appearance. It has four or six catgut or wire strings attached to screw-pegs in the head; two of the strings stretch over the sounding-board to the tailpiece, and are sounded by a wooden wheel (under the cover *a* in the fig.) charged with rosin, which is turned by means of a handle with the player's right hand. The strings are 'stopped' by an ingenious arrangement of keys, *b*, manipulated with the left hand. The remaining strings are stretched out of reach of the keys, and are tuned as drones. The instrument has a range of two octaves from the tenor G upwards. The rustic simplicity of its music made it at one time a great favourite among the peasantry of a great part of Europe (see Engel's *Musical Instruments*). The name hurdy-gurdy is also sometimes applied to the mechanical pianos familiar on the streets. The word was probably coined to express contempt of the instrument.



Hurdy-gurdy.

**Hurlingham,** at Fulham (q.v.) in Middlesex, on the Thames below the bridge, the headquarters of aristocratic Pigeon-shooting (q.v.).

**Huron,** the second in area of the five great lakes on the frontier between the United States and Canada, is connected at the north-west by St Mary's River with Lake Superior, and through the strait of Mackinaw with Lake Michigan. On the south it has an outlet by way of the St Clair River. It is bounded on the W. and SW. by Michigan, and elsewhere by Ontario. The lake is divided into two unequal parts by the Cabot's Head peninsula and Grand Manitoulin island, the parts to the north being called North Channel and Georgian Bay. Its extreme length is 263 miles; its greatest breadth, exclusive of Georgian Bay, 105 miles; average breadth, 70 miles. The area of the entire lake is 23,800 sq. m.; it is larger than Lake Michigan, although its basin is smaller. According to the perfected levels of the United States Lake Survey, its mean elevation is $581\frac{3}{10}$ feet above sea-level; it is $20\frac{1}{2}$ feet below Lake Superior, and $8\frac{1}{10}$ above Lake Erie. Huron has a mean depth of about 250, and a maximum depth of 750 feet. There is an average difference between high and low water (due to winds and rain) of $1\frac{3}{10}$ foot. Huron, like the other lakes, is subject to violent storms. It contains about three thousand islands, nearly all Canadian; some of them are of considerable size. The waters are very clear and pure, and abound in fish. There are numerous good harbours and roadsteads, most of them on the Canadian side; at Sand Beach, Michigan, there is a harbour of refuge. See Crosman's *Chart of the Great Lakes* (Milwaukee, 1888).

**Huronian,** a subdivision of the Archæan rocks of Canada. See ARCHÆAN SYSTEM.

**Hurons,** a once powerful tribe of American Indians, belonging to the Huron-Iroquois family. In the early part of the 17th century the Hurons numbered about 30,000 persons, living in twenty-five villages within a small territory near Georgian Bay. By the end of the century the tribe had been nearly destroyed by the Iroquois, famine, and disease; and in 1693 the few survivors were removed by the French to Jeune Lorette, near Quebec. Here two or three hundred descendants still live; but very few are of pure blood, and all are Catholics, and have abandoned their own language for French.

**Hurricane.** See STORMS, and WIND.

**Hursley,** a village of Hampshire, 5 miles SW. of Winchester. John Keble, author of the *Christian Year*, was vicar here from 1835 till his death in 1866. In 1848, with the profits of that celebrated work, he restored the church, which is rich in modern stained glass. Keble himself lies buried in the churchyard, and in the chancel is the grave of Richard Cromwell.

**Hurstmonceaux,** a village of Sussex, 5 miles N. of Pevensey, with the extensive ivy-covered ruins of a fine castle, built of brick under Henry VI. by Sir Roger de Fienes, one of the heroes of Agincourt. It passed in 1727 into the hands of the Hares or Hare-Naylors. The then head of the house, Bishop Hare, took good care of the estate, but its resources were shamefully squandered by the two succeeding heirs, and about the close of the century the castle was unroofed and its valuable contents sold off at a six weeks' sale. A modern mansion was built near its ruins. The famous Broad Church leader, Archdeacon Hare (q.v.), was rector of the parish from 1832 till 1855, and lies buried in the churchyard. The church is Early English, with Perpendicular windows, and contains, among other ancient monuments, the fine canopied altar-tomb of the second Lord Dacre.

**Hurstpierspoint,** a market-town of Sussex, 8 miles N. by W. of Brighton. Here is St John's College (1849), a middle-class school in connection with Lancing (q.v.). Pop. of parish, 2736.

**Husband and Wife.** The marriage-contract is for the joint lives of the parties, and comes to an end with the death of either; they cannot themselves put an end to it or escape from its obligations, except by means of a legal Divorce (q.v.) or Separation (q.v.). It is a not uncommon delusion among working-people that if a husband or wife runs away or disappears the deserted spouse may lawfully marry again; but this is not the case. If husband or wife disappears, and is not heard of for seven years, the party deserted may marry again without incurring the risk of a conviction for bigamy; but even in this case the second marriage is a nullity if the first husband or wife is alive at the time when it is solemnised. During its continuance the contract has important effects on the rights and mutual relations of the parties. The husband is, in law, the head of the house; he has a right to choose the family domicile, and to require his wife to cohabit with him there. He may sue and be sued, enter into contracts, and dispose of his property as freely as a single man; the modern English law permits him to bequeath his property without making any provision for his wife, and to bar her claim to dower in disposing of his landed estate. He is bound to maintain his wife and children; if, being able to maintain them, he neglects to do so, his goods may be seized and sold by the parish authorities, or he may be imprisoned for one month as a disorderly person. If he deserts his wife and family, leaving them to become a charge on the parish, he may be treated as a rogue and vagabond, and imprisoned for three months. If his wife leaves him without just cause he is not bound to support her, and he may compel her to return by bringing an action for the restitution of conjugal rights. But if there is just cause for separation—if, for example, the husband is guilty of what the law deems cruelty—as keeping a mistress in the house, or starving and beating his wife—the wife is not bound to return, and the husband will be liable for the price of necessaries ordered by her on his credit. When the parties are living together, the question whether the wife has authority to pledge her husband's credit must be decided on consideration of all the facts of the case. No authority is implied from the mere fact of marriage, and tradesmen are not safe in relying on the wife's assertion in such cases; but a woman who keeps her husband's house may be taken to have authority to order food and clothing suitable to their rank in life, unless the husband has taken steps to protect himself from liability, as, for example, by giving notice to the tradesman not to trust his wife. Much misconception prevails in regard to the extent of a wife's authority; and there is a class of small traders, called tallymen, who take advantage of the popular ignorance. They persuade working-men's wives to purchase dresses or other goods, to be paid for by instalments; on default in payment, the husband is often made to pay heavily for his wife's improvidence, though it may be that in law he is not liable at all. In such a case it is sometimes best for the husband to allow himself to be taken into a county court, where the judge will see that the tallyman gets no more than his due. A policy of insurance, effected by a husband on his own life for the benefit of his wife or children, is protected against his creditors.

A married woman is called in law French *feme coverte;* she is protected by her husband and under his control, and the two are, for many purposes, one person in law. If she commits a crime in his company or under his coercion the crime is his, not hers; he is punished and she escapes; but this rule does not apply to treason, murder, and other heinous offences. Formerly she could sue only by her next friend, and if she was sued, her husband was joined; but modern rules permit her to sue and defend alone. At common law the wife's personal property vested in the husband; he took the profits of her land during the marriage; and if an heir was born of the marriage the husband became 'tenant by the courtesy of England,' and held the land for his own life if he survived his wife. He assumed her liabilities also, and might be sued for her ante-nuptial debts. But at an early period courts of equity decided that, where property was given for the separate use of a married woman, she herself should have the use and disposition of it; if such property came into the husband's hands he held it as trustee for her. This doctrine of separate use has been greatly extended by the Married Women's Property Acts of 1870, 1874, and 1882. These acts do not apply in their integrity to women married before they came into operation; it is therefore necessary in ascertaining the rights of a wife to know when she was married. Under the Act of 1882 a wife holds her realty and personalty as her own separate property; she may enter into contracts relating to it, and dispose of it as freely as a *feme sole.* Her property is liable for her separate debts, and execution may issue against it, though not against her person. Her husband is not liable for her ante-nuptial debts, except to the value of any property which comes to him through her. She may insure her own or her husband's life for her separate use. All earnings of the wife are protected by the Married Women's Property Acts; and under an earlier act a woman separated from her husband may obtain a magistrate's order protecting her earnings. A woman who has property may be made liable under the poor-law for the maintenance of her husband and children.

Marriage is a 'valuable consideration,' and a settlement of property made in pursuance of the contract stands good even against creditors. Provisions for the benefit of children are 'within the scope of the marriage bargain.' A post-nuptial settlement, unless made in fulfilment of a previous bargain, is not made in consideration of marriage; it may be upset by creditors like any other voluntary transfer of property.

The old rule that husband and wife are one person has been so far set aside by legislation that some of the consequences deduced from it are now doubtful in point of law. Formerly, if property were given in equal shares to husband and wife and a third person, the husband and wife took half and the third person the other half; and it has been decided that this rule applies even in a case of a gift or will made since 1882. Again, it used to be held that a woman could not be convicted of stealing her husband's goods; but sections 12 and 16 of the Act of 1882 enable married persons to prosecute one another. Except in cases within the act, and cases of personal injury inflicted by one spouse on the other, husband and wife cannot give evidence in criminal proceedings against one another: thus, on a trial for bigamy, the first wife cannot be called to prove her own marriage. In civil actions the spouses are competent witnesses for and against one another.

A husband surviving his wife is entitled to her personal property not disposed of by her, and has *a paramount claim* to administer her estate. A wife surviving her husband is entitled to one-third of his personalty not disposed of by him, and she has a claim to administer; she has also a claim to dower—i.e. a life-estate in one-third of his land, unless the claim to dower has been barred.

In the United States the law of husband and wife is based upon the common law of England as above explained. The legislation of the different states, however, has diverted the common law rules with somewhat varying effect in the direction of the recent English statutes, and considerably in advance of them upon the same lines. A long series of statutes, beginning at an earlier period than in England—about 1844—has now swept away the disabilities laid upon married women by the common law. Wives are now generally able to hold property, real and personal, in their own right, to enter into contracts, and to sue in their own names. They are on substantially an equal footing with unmarried women; and it is not uncommon for married women to carry on business in their own names and with full power to enforce contracts. The old rule that husband and wife are one person in law is now practically obsolete. A wife may contract with her husband and may sue him upon the contract, in some states directly, in others through the intervention of a guardian or trustee. The independent position conceded by the law to married women in the United States is a chief cause of the recent increase and frequency of divorce in that country.

The law of Scotland has specialties of its own. The *husband is the legal curator of his wife;* and if at the time of the marriage she have another curator, the office of this last expires. Thus actions brought against a wife must be brought also against the husband for his interest, and the husband must concur in actions raised by the wife. The husband further in his capacity of curator signs as consenter to the wife's deeds. The husband is liable for the ante-nuptial debts of his wife; but under the Married Women's Property Act, 1877, this liability is limited to the amount by which the husband receives profit from the marriage. The wife has power to bind her husband in so far as she acts with his authority and as his agent. With regard to furnishings to the family, the wife is presumed by law to be the manager of the household, *præposita negotiis domesticis*, and so to be authorised to bind the husband. This presumption can only be removed by inhibition or by private notice from the husband to tradesmen. The *jus mariti*, or husband's right, had the effect of transferring to the husband upon marriage all the personal property of the wife belonging to her at the time of the marriage, or acquired by her during its subsistence. It also gave the husband the rents and yearly income of her heritable property; but it did not extend over the wife's paraphernalia. Besides the *jus mariti*, the husband possessed the right of administration of his wife's heritable property. In virtue of this right, the husband's consent is necessary to all acts by which the wife deals with her heritage. Both of these rights may be renounced by the husband or excluded by special contracts and settlements; and with regard to marriages that come under the Married Women's Property Acts these rights are to a great extent extinguished.

The effect of the Married Women's Property Act, 1882, is to abolish the *jus mariti* altogether with regard to marriages contracted after its date; to vest in the wife as her own separate estate all the movable property acquired by her at any time. The statute practically does away with the husband's right of administering the income of the wife's estate. The earnings of married women and those of women living separate from their husbands are protected by prior statutes against the husband and his creditors. On the death of a wife the surviving husband has a liferent interest, called courtesy, in her heritable estate; and has the same interest in her movable estate as a widow has in the movable estate of her deceased husband—i.e. a share amounting to one-half if there are no children, and one-third if there are. This share, when it falls to a widow out of the estate of her deceased husband, is hers by virtue of the *jus relictæ* or relict's right. The widow has further, where she has no conventional provision, a right to the terce, which is a liferent of a third of the husband's heritable property.

See works by Lush (1884), Macqueen (3d ed. 1885), Schouler (Boston, 1882), and Thicknesse (1884).

**Husch**, or Husi, a town of Moldavia, near the Pruth, 38 miles SSE. from Jassy, cultivates tobacco and the vine. It was founded by fugitive Hussites in the 15th century. Here was signed in 1711 the treaty between the Russians and Turks by which Peter the Great rescued his army, surrounded by the foe. Pop. 18,500.

**Huskisson**, William, statesman and financier, was born at Birch Moreton, in Worcestershire, 11th March 1770, and in 1783 was sent to Paris to study medicine. He was present at the storming of the Bastille, and as a member of the Club of 1789 attracted attention by a speech on the assignats. Returning to England, he was appointed in 1795 under-secretary in the Colonial Department. Next year he entered parliament for Morpeth as a supporter of Pitt. Being returned for Liskeard in 1804, he was appointed secretary of the Treasury; and he held the same office under the Duke of Portland (1807–9). In 1814 he became chief Commissioner of the Woods and Forests; in 1823 President of the Board of Trade, and treasurer of the navy; and in 1827 Secretary of State for the Colonies. But he resigned office finally in the following year. Through his exertions the old restrictions on the trade of the colonies with foreign countries were removed. He also obtained the removal or reduction of many import duties, considerable relaxation of the navigation laws, and is allowed to have been an active pioneer of free trade. He received fatal injuries at the opening of the Liverpool and Manchester Railway, 15th September 1830, and died the same evening. A collection of his speeches, with a Life prefixed, was published in 3 vols. in 1831.

**Huss**, or more properly Hus, John, Bohemian reformer and martyr, was born in (probably) 1369, the son of a Bohemian peasant, at Husinec (of which Hus is a contraction), NW. of Budweis. Two years after taking (1396) his master's degree at the university of Prague he began to lecture there on theological subjects. He had at this time already come under the influence of Wyclif's writings, in all probability through Anne of Bohemia's retinue, and he is believed to have made them the basis of his teaching. In 1402 he was appointed rector of the university, and began to preach at the Bethlehem chapel in the city of Prague. It was not, however, until the year 1408 that he came into conflict with the Roman Catholic Church. In that year certain of his pulpit utterances against clerical abuses were laid hold upon by the clergy of the diocese and city of Prague, and made the ground of a formal complaint against him to the archbishop, Sbynko. In consequence of this Huss was forbidden to exercise priestly functions within the diocese. Early in the following year the element of political feeling was infused into the quarrel, all the strong interests of the awakening national consciousness ranging themselves in support of the reformer, who by his preaching had completely won the hearts of the common people. Although Huss was again elected rector of the university in October 1409, the archbishop commissioned an inquisitor to investigate the charges of heretical teaching which had been alleged against him. And it was undoubtedly in connection with this proceeding that in December the pope (Alexander V.) promulgated a bull in condemnation of Wyclif's teaching, and ordered all his writings to be publicly burned, and at the same time forbade preaching in any except collegiate, parish, and monastery churches. This, however, not being sufficient to prevent Huss from continuing his preaching, he was in the following July excommunicated by the Archbishop of Prague. Popular riots followed in the city, and Huss, backed by the people, still maintained his position; nor did he yield one jot even after the entire city was laid under a papal interdict in 1411. But by the last month of the following year matters had greatly changed, in consequence of Huss having spoken out yet more boldly against the church; hence some of his more influential supporters, including the university, had fallen away from him, so that he was constrained to yield to the desire of the king of Bohemia, Wenceslaus, that he should absent himself from Prague. He found refuge at the castles of certain of his supporters, for nearly the whole body of the nobles were with him. This enforced leisure he employed chiefly in the composition of his principal work, *De Ecclesia*. This book, together with many of Huss's minor writings, contain numerous passages taken almost verbatim from Wyclif's works; and the authorities of the Roman Catholic Church must have looked upon Huss as the expounder and propagator of Wyclif's views. About this time a general council was summoned to meet at Constance, and Huss was called upon to present himself before it, in order to have his case adjudicated upon. Provided with a 'safe conduct' from the Emperor Sigismund, he journeyed to Constance, arriving there on 3d November. Three weeks later, in violation of his safe-conduct, he was seized and thrown into prison. No precise charge had been lodged against him; but he had resumed preaching after his arrival in Constance. An ill augury for Huss was the condemnation of Wyclif's writings by the council in May 1415. His own trial began on 5th June following; but he was not permitted to speak freely in his own defence, nor allowed to have a defender to speak in his behalf. Called upon to recant unconditionally, to make full submission to the council, and to pledge himself not to preach or teach the doctrines that were put in accusation against him, Huss categorically refused, and was forthwith led to the stake, and burned to ashes, on 6th July.

HUSSITES.—The news of the imprisonment and death of John Huss roused popular feeling in Bohemia to the highest pitch of wrath and indignation. Whilst the masses gave way to rioting and murdered Roman Catholic ecclesiastics, 452 nobles, in a diet which had been hastily summoned at Prague in September 1415, solemnly attested their confidence in Huss, and their admiration of his personal character, and three days later formed themselves into a league for the maintenance of liberty of preaching in Bohemia, and for upholding their belief in the Word of God as the ultimate lawgiver of the church. For this they were excommunicated by the council. Both parties now prepared for war. Yet it soon became apparent that the Hussites were not all of one mind; for, as in all great popular movements of this kind, there was an extreme party who were desirous of carrying things to the greatest lengths. The more moderate section formulated their demands in four articles, preaching of the gospel in the Bohemian language, the right of the laity to receive the communion in both kinds, reform of clerical abuses, and the prohibition of the clergy to hold secular property and exercise secular jurisdiction; these were called Praguers, but more frequently Calixtines (*calix* = a chalice) or Utraquists (from their claiming communion *sub utraque specie*). The extreme party, headed by Ziska (q.v.), and called Taborites, from their headquarters being at Mount Tabor, some 24 miles NE. of Pisek, went beyond the Utraquists in their condemnation of purgatory, the worship of saints, of images, and of relics, and the practice of penance, and in their assertion of the right of the laity, even of women, to preach, and that in any building they pleased. At this period too King Wenceslaus died, and the throne of Bohemia was claimed by his brother, the Emperor Sigismund. Nevertheless, both parties united in offering a stubborn resistance to the emperor, and his forces were defeated at Ziskaberg in 1420, at Deutsch-Brod in 1422, at Aussig in 1426, and at Taus in 1431. Under the two brothers Procopius the Hussites invaded Silesia, Saxony, and Franconia; they were said to have taken and destroyed more than 100 towns and 1500 villages; according to a doubtful legend, Naumburg was saved by the intercession of the school-children. After the battle of Taus negotiations were begun, which ended, two years later, in the Calixtines securing their ends by the 'Compactata of Prague,' which was signed by the delegate of the Council of Basel on 30th November. This pacification the Taborites refused to accept, and in the contest that then ensued between them and the Calixtines, they were worsted at Lipan near Kolin and at Hrib near Böhmisch-Brod in 1434, and from that time rapidly disappear from history. Two years later the Emperor Sigismund, after ratifying the 'Compactata' with his signature, was accepted by the Bohemians as their king. The Utraquists finally became merged in the Moravian Brethren (q.v.).

See *Documenta Johannis Hus vitam, doctrinam, causam illustrantia* (ed. by Palacky, 1869), and monographs by Becker (1858), Krummel (1863), Berger (1872), Wratislaw (in English, 1882), and Loserth (1884; Eng. trans. 1884); Denis, *Huss et la Guerre des Hussites* (1878); Palacky, *Urkundliche Beiträge zur Geschichte des Hussitenkriegs* (1872–73); Krummel, *Geschichte der Böhmischen Reformation* (1866); Bezold, *Sigmund und die Reichskriege gegen die Hussiten* (1872–77), and *Zur Geschichte des Hussitenthums* (1874); Wratislaw, *John Hus* (1882); Loserth, *Wiclif and Hus* (Eng. trans. 1884); Leger, *History of Austro-Hungary* (Eng. trans. 1890); and the articles on ZISKA, PODIEBRAD, CONSTANCE, WYCLIF, &c.; and for Huss's writings, the section 'Literature' of the article BOHEMIA.

**Hussar,** a light-cavalry trooper, wearing in full dress a tunic and Busby (q.v.), and armed with sabre and carbine. The 10th and 18th Light Dragoons were changed in 1806–7 to Hussars, the earliest in the British army, which now has thirteen hussar regiments. The name comes from the Hungarian *husz-ar* 'twentieth,' Matthias Corvinus having in 1458 raised a body of cavalry against the Turks by commanding one man to be chosen out of every twenty in each village.

**Husum,** an old town in the Prussian province of Sleswick-Holstein, 23 miles W. of Sleswick by rail and 2½ from the North Sea. Pop. 6267.

**Hutcheson,** FRANCIS, a distinguished philosopher of the 18th century, was the son of a Presbyterian minister in the north of Ireland, where he was born in 1694. He studied for the church at the university of Glasgow, but shortly after the completion of his theological course he was induced to open a private academy in the city of Dublin, which proved highly successful. In 1720 he published his *Inquiry into the Original of our Ideas of Beauty and Virtue*, &c., which was the means of introducing him to the notice of many influential personages, such as Lord Granville, then lord-lieutenant of Ireland, Archbishop King, Primate Boulter, and others. This work was followed in 1728 by his *Essay on the Nature and Conduct of the Passions*; and in the year after he was appointed professor of Moral Philosophy in the university of Glasgow. Here he died in 1747. In his lifetime he published various minor books, including a small treatise on *Logic*; but his largest work, *A System of Moral Philosophy*, was published at Glasgow in 1755 by his son, Francis Hutcheson, M.D., with a Life by Dr Leechman. As a metaphysician Hutcheson may in some respects be considered a pioneer of the so-called 'Scotch school' and of the common-sense philosophy, although he is largely influenced by Locke. From the delivery of Hutcheson's lectures, according to Dugald Stewart, may be dated the metaphysical philosophy of Scotland. But it is as a moral philosopher, rather than as a metaphysician, that Hutcheson was conspicuous. His system is to a large extent that of Shaftesbury, but it is more complete, coherent, and clearly illustrated. Hutcheson is a strong opponent of the doctrine that benevolence has a selfish origin; he is practically a utilitarian; and the faculty by which moral distinctions are recognised Hutcheson (after Shaftesbury) terms a *moral sense.* See Ethics, and Fowler, *Shaftesbury and Hutcheson* (1882).

**Hutchinson,** Anne, a religious enthusiast, was the daughter of a Lincolnshire clergyman called Marbury. Born in 1590, she married a Mr Hutchinson, and in 1634 they emigrated from Lincolnshire, England, to Boston, Massachusetts. She held various theological heresies; amongst others, that the person of the Holy Ghost dwells in justified persons. She held meetings, lectured, and denounced the Massachusetts clergy as being with few exceptions 'under the covenant of works, not of grace.' Her followers were charged with Antinomianism (q.v.). Great controversies arose, and a synod was called, in which her teachings were condemned; and being tried for heresy and sedition, she was banished from the colony. She and her friends acquired territory from the Narragansett Indians of Rhode Island, where they set up a community on the highly commendable principle that no one was to be 'accounted a delinquent for doctrine.' After the death of her husband (who shared her opinions) she removed to a new settlement in what is now New York state, where, in 1643, she and her whole family of fifteen persons were taken prisoners by the Indians, and all but one daughter barbarously murdered.

**Hutchinson,** John, an English theological writer, born in 1674 at Spennithorne, in Yorkshire. He was for some time steward of the household of the Duke of Somerset, and left his service to devote himself to his religious studies, the duke procuring for him a sinecure appointment of £200 a year from government. In 1724 he published the first part of a work called *Moses' Principia*, in which he defended what he regarded as the Mosaic cosmogony, and assailed Newton's theory of gravitation. He continued to publish a succession of works till his death, which took place on 28th August 1737. His religious system is best exhibited in his *Thoughts concerning Religion.* The leading principle of it is that the Holy Scriptures contain the elements not only of true religion, but of all rational philosophy, which, however, was to be derived only from the original Hebrew; and it, for that purpose, was subjected to strange critical or rather fanciful processes. His followers were called Hutchinsonians, and among them were persons of considerable learning and celebrity. Ministers of some of the Scottish Presbyterian churches are yet required explicitly to renounce the errors of the Hutchinsonians.

**Hutchinson,** Colonel John, the type of the Puritan gentleman, was the son of Sir Thomas Hutchinson, and was born at Nottingham in September 1616. He studied at Cambridge, and next for a short time at Lincoln's Inn, and married in 1638 Lucy, daughter of Sir Allan Apsley. He now retired to Owthorpe, and here his meditations on the troubled theology and politics of the time led him at last to side with the parliament rather than the king. He became governor of Nottingham, and successfully held the town against enemies without and intrigue and calumny from within till the close of the struggle. About the beginning of the year 1646 he was sent up by Nottingham to fill his father's place in the parliament, and later sat as one of the commissioners in the High Court of Justice for the king's trial, and signed the warrant for his execution. He sat in the first council of state, but gradually became alarmed at the ambitious schemes of Cromwell, and ceased to take an active part in politics. At the Restoration, along with other regicides, he was included in the Act of Amnesty, but later was imprisoned for about a year in the Tower and at Sandown Castle in Kent on a groundless suspicion of treasonable conspiracy, and died 11th September 1664. The *Memoirs*, written by his widowed wife for her children, was first published in 1806, and revealed to the world a delightful picture of a grave and courteous gentleman, beautiful and accomplished; tender to his family and the poor; fearless, frank, and honest in temper; intense in devotion, yet entirely free from austerity and fanaticism. The unsought beauty of the style, and the absolute sincerity and truthfulness of the narrative, give the book an almost unique place among English biographies, and the tender devotedness of loving memory with which throughout it is informed has still power to touch the modern reader with a thrill of sympathetic emotion. An excellent edition, by C. H. Firth, was published in 1885.

**Hutten,** Philip von, a German adventurer, and a cousin of Ulrich von Hutten, was born at Birkenfeld about the end of the 15th century, and was educated at the court of Henry of Nassau. In 1528 the Emperor Charles V. made a grant of the province of Venezuela to the Welsers, a firm of rich Augsburg merchants; and Hutten sailed with one of the companies they sent out. He accompanied the viceroy, Georg Hohemut, in a long journey (1536-38), in which they reached the headwaters of the Rio Japura, near the equator. In 1541 he set out in search of the Golden City. After several years of wandering, harassed by the natives and weakened by hunger and fever, he and his followers came on a large city, the capital of the Omaguas, in the country north of the Amazons; and attacking this place, they were routed by the Indians, and Hutten himself severely wounded. He led those of his followers who survived back to Coro in 1546, where Juan de Caravajal had in the meantime usurped the office of viceroy; and by him Hutten and his lieutenant, Bartel Welser, were seized and beheaded. Eight years later the Welsers' grant was taken from them, and the rule of the Germans in Venezuela came to an end. Hutten left a narrative of his journeyings, which was published under the title *Zeitung aus Indien* (1765). See also Von Langegg, *El Dorado* (Leip. 1888).

**Hutten,** Ulrich von, poet, humanist, and reformer, was born on 21st April 1488, of an old Franconian family whose seat was at Steckelberg, near Fulda. Being puny and small of stature, and of weak health, he was destined, although the eldest son, for the tonsure, and was sent in 1499 to the Benedictine monastery of Fulda. But his temperament—proud, high-spirited, impetuous, impatient of contradiction and of restraint—did not fit him for leading the religious life, and in 1504 or 1505 he fled away from the monastery. Consumed with a devouring hunger for knowledge, especially for the new Humanistic learning, Hutten visited the chief universities of northern Germany, and finally passed by way of Vienna into Italy (1512). During these years he was often utterly destitute, and generally ill, sustained only by his love for the New Learning and his indomitable spirit. His first works—Latin poems—were printed in 1509; and in the same year he wrote the first of his many bitter satires. From this time onwards his pen never rested; when not employed in behalf of the great cause it was busy in some private feud or quarrel. In Italy Hutten remained nearly two years. On reaching home he was received with distinction at the court of Albert, Archbishop and Elector of Mainz. There he first became acquainted with Erasmus, the leader of the Humanistic movement. In the spring of 1515 all the fiery combativeness of Hutten's nature was roused by the murder of his cousin Hans, who had been wantonly slain by Ulrich, Duke of Wurtemberg. The young poet launched denunciation after denunciation at the guilty duke, and called upon the emperor to punish the offender; and, himself girding the sword upon his thigh, he marched into Wurtemberg along with the army of vengeance his family had raised. His friends then sent him back to Italy to study law. At Rome and at Bologna he spent nearly two years, and came home to enter the service of the Archbishop of Mainz. It was at this time that he wrote his most important work, his share of the *Epistolæ Obscurorum Virorum* (q.v.).

Having been formally crowned poet-laureate of Germany by the Emperor Maximilian at Augsburg in 1517, Hutten began the real work of his life, his deliberate assault upon papal aggressiveness, in an ironical dedication to Leo X. of a new edition of Laurentius Valla's exposure of the fictitious Donation of Constantine. When he first heard of Luther's revolt, Hutten looked upon it as a mere monks' quarrel. In 1519 he took part, along with his subsequent friend and patron, Franz von Sickingen, in the campaign of the Swabian League against his old enemy, Duke Ulrich of Wurtemberg. But this concluded, he returned to the attack upon the papal power. The ideal that possessed his soul was to create a national Germany, delivered from the hateful interference, extortion, and spiritual tyranny of supercilious priests from beyond the Alps. But he also aimed at an intellectual reform of the so-called learned classes, through the spread of the New Learning, and at the cultivation of refinement in the habits and manners of his countrymen. At length he came to understand the real significance of Luther's action, and, at once joining hands with him, he espoused the reformer's part with his customary impetuosity and vehemence. Henceforward he was more closely identified with the Reformation than with the Humanistic movement. A set of dialogues which he published in 1520 contained *Vadiscus*, his formal manifesto against Rome. This at last stung the pope to take retributive measures, and he caused the archbishop to dismiss Hutten from his service. Hutten found shelter in Sickingen's strong castle of Ebernburg in the Palatinate, whence during the next two years he discharged a perfect shower of invectives, denunciations, and satires at the heads of the Romanists, and wrote appeal after appeal to the German emperor, the princes and nobles, bishops, scholars, and people, urging them to shake off the tyrannous domination of the enemies of their country. And in order to get at the common people he began to write in the vernacular, his earliest work in German being *Aufwecker der teutschen Nation* (1520), a poem in which Hutten's satiric powers reach their highest pitch. Sickingen's castle having become unsafe, Hutten fled in 1522 to Basel, where he was greeted with marked coldness by Erasmus. This estrangement shortly afterwards gave rise to a bitter epistolary quarrel. At Basel Hutten was again attacked by the odious disease from which he had suffered since boyhood; and, after seeking a safe retreat at Mühlhausen and at Zurich, was befriended by Zwingli, who found him an asylum on the little island of Ufnau in the Lake of Zurich. There Hutten ended his stormy and painful life in August or September 1523. Coming from a master in passionate invective—'the German Juvenal'—his writings have a vigour, a rush, a rhetorical fullness and eloquence that have made them live to the present day. In respect of literary form his writings fall into three divisions: (1) Latin poems (1509-16); (2) letters and orations (1515-17); and (3) dialogues and letters, including his German writings (1517-23). See *Opera Omnia* (7 vols. ed. Böcking, Leip. 1859-62), and Strauss's Life (4th ed. 2 vols. Bonn, 1878; Eng. trans. by Sturge, 1874), which has superseded the older biographies.

**Hutter,** LEONHARD, a zealous champion of Lutheran orthodoxy, was born in 1563 at Nellingen, near Ulm, and filled the chair of Theology at Wittenberg from 1596 till his death in 1616. His *Compendium locorum theologicorum ex scriptis sacris et libro concordiæ collectum* (1610) took the place of Melanchthon's *Loci*, and was long a popular work, as was also his *Concordia concors sive de origine et progressu formulæ concordiæ ecclesiarum Augustanæ confessionis* (1614). As Hutter is taken as a representative of a strongly symbolical manner of belief, his name was adopted by Hase (q.v.) in his well-known rehabilitation of the Old Lutheran dogmatic, *Hutterus Redivivus* (1828; 12th ed. 1883).

**Hutton,** CHARLES, mathematician, was the son of a superintendent of mines, and was born at Newcastle-upon-Tyne, 14th August 1737. He seems to have worked for a short time in a colliery; but from 1755 to 1773 he was a teacher in schools at Jesmond and Newcastle. During this period he published works on arithmetic (1764), mensuration (1771), and bridges (1772). In 1773 he was appointed to the professorship of Mathematics at the Royal Military Academy, Woolwich, and in 1774 was elected a Fellow of the Royal Society. Soon after this he was selected to perform the necessary calculations for determining the density of the earth from Dr Maskelyne's observations on Schiehallion, and his report was published in the *Philosophical Transactions* for 1778. In 1779 he received the degree of LL.D. from the university of Edinburgh. He resigned the professorship in 1807, retiring on a pension; and he died 27th January 1823. Hutton's most important works are *Tables of Products and Powers of Numbers* (1781), *Mathematical Tables* (1785), *Mathematical and Philosophical Dictionary* (1795), *Course of Mathematics* (1798-1801), and *Recreations in Mathematics and Natural Philosophy* (4 vols. 1803—largely from the French). Besides these, he contributed mathematical papers to the *Philosophical Transactions*, and had an important share in preparing an abridgment thereof (18 vols. 1809).

**Hutton,** JAMES, one of the founders of geology, was born at Edinburgh, 3d June 1726. He studied medicine in his native city and at Paris and Leyden, but on his return home (1754) he settled in Berwickshire and devoted himself to agricultural pursuits and to chemistry, from which he was led to mineralogy and geology. In 1768 he removed to Edinburgh, and there spent his time in scientific, especially physical, investigations, and there he died, 26th March 1797. The views most characteristically associated with his name were first made known in two papers read before the Royal Society of Edinburgh, *A Theory of the Earth* (1785) and *A Theory of Rain* (1784). The former was afterwards expanded into two volumes, published in 1795. Hutton there laid down the views that the upraised land of the globe must be worn away by atmospheric influences and the debris be finally deposited in the bed of the sea, where they are consolidated under great pressure; they are then forced upwards by subterranean heat acting with an expansive power, and thereby split and cracked, the fissures at the same time filling with molten mineral matter; and so the process goes on. The formation of rain he ascribed to the mingling of two strata of air of different temperatures and the subsequent condensation of the mixture. He also wrote *Dissertations in Natural Philosophy* (1792), *Considerations on the Nature of Coal and Culm* (1777), and other works. See GEOLOGY.

**Huxley,** THOMAS HENRY, biologist, born at Ealing, Middlesex, 4th May 1825, commenced his education at the school in that place, then a small village, and afterwards studied medicine in the Medical School of Charing Cross Hospital. In 1846 he entered the medical service of the royal navy, and did duty at Haslar, until the winter of the same year, under the late Sir John Richardson, by whose influence he was appointed assistant-surgeon of H.M.S. *Rattlesnake*. This vessel, commanded by Captain Owen Stanley, was commissioned to survey the intricate passage within the Barrier Reef skirting the eastern shores of Australia, and to explore the sea lying between the northern end of that reef and New Guinea. Huxley devoted himself with zeal to the study of the numerous marine animals collected during the survey, and made them the subjects of scientific papers, which were published by the Royal and Linnean societies. Towards the end of 1850 the *Rattlesnake* returned to England, and Huxley had the gratification to find that his paper *On the Anatomy and Affinities of the Family of the Medusæ* had been published in the *Philosophical Transactions*. In 1851 Huxley was elected a Fellow of the Royal Society; in 1852 one of the two Royal medals annually given by the Society was awarded to him; and in 1853 he contributed to the Society's *Transactions* a memoir on the morphology of the Cephalous Mollusca. In 1854 he was appointed professor of Natural History, including Palæontology, in the Royal School of Mines in place of Professor Edward Forbes, and held that office, combined with the curatorship of the fossil collections in the Museum of Practical Geology, until his retirement from the public service in 1885. It was part of the duty of the professor to deliver a course of six lectures to working-men every alternate year. Some of these have been published. In 1854 he published contributions to the anatomy of the *Brachiopoda*, in which some hitherto unsuspected peculiarities of their structure were described; and in this and the preceding year he wrote several essays on histological subjects. In 1856 he accompanied his friend Dr Tyndall in his first visit to the glaciers of the Alps, and his name appears as joint-author of a paper, *Observations on Glaciers* (*Phil. Trans.* 1857). In 1859 his large work on *The Oceanic Hydrozoa; a Description of the Calycophoridæ and Physophoridæ* observed during his voyage, was published by the Ray Society with illustrative plates. After his appointment to the Royal School of Mines, Huxley's attention was chiefly directed to vertebrate morphology and to palæontology, with occasional excursions into the region of ethnology; but papers on the agamic reproduction and morphology of *Aphis* (1858), on the development of *Pyrosoma* (1860), a manual of the Invertebrata (1877), and classification and distribution of Crayfishes (1878) are evidence that the Invertebrata were not neglected. In vertebrate morphology the most important papers are the Royal Society's Croonian lecture, *On the Theory of the Vertebrate Skull* (1858); various papers on the brain in man and apes, and on the relation of man to the lower animals, and *Man's Place in Nature* (1860-63); on the classification of Birds, and on the *Dinosauria* (1868-70); the article 'Amphibia' in *Ency. Britannica* (1875); *On Ceratodus* (1876); the cranial and dental structure of the *Canidæ* (1880); *Lectures on Comparative Anatomy* (1864); *An Introduction to the Classification of Animals* (1869). In palæontology, besides various papers on other fossil Invertebrata, memoirs on *Pterygotus* (1858) and *Belemnites* (1864); a series of papers on *Staganolepis Robertsoni* and *Hyperodapedon Gordoni* (1859-77-87); preliminary essay and descriptions of Fossil Fishes in the Decades of the Geological Survey (1862); *Glyptodon* (1863); Neanderthal Skull (1864); Reptilian Remains from India (1864); *Telerpeton* (1866); Amphibia from the Kilkenny Coal-measures (1867-71); *Hypsilophodon* and Evidences of Affinity between Reptiles and Birds (1869-70); *Chelonia* from Lord Howe Island (1887). In physiology, a short treatise, *Lessons in Elementary Physiology*. Essays on topics of a philosophical and general character are collected in *Lay Sermons*, &c. (1870); *Critiques and Addresses* (1873); *American Addresses* and *Physiography* (1877); a short work on *Hume* (1879); and *Science and Culture* (1881).

Huxley has greatly interested himself in educational questions, and especially in scientific and medical education, and strongly advocated Darwin's views and evolutionist doctrines in general. He has held the offices of examiner in the university of London, of Fullerian professor at the Royal Institution, of Hunterian professor of Comparative Anatomy at the Royal College of Surgeons, of president of the Ethnological Society and of the British Association. He has been secretary and president of the Geological Society, and secretary and president of the Royal Society. He was elected in 1873 Lord Rector of the university of Aberdeen, and a member of the London School Board in 1870. He was an active member of the Royal Commission on Sea-fisheries (1864-66), and has served on several other commissions; and he was inspector of Salmon-fisheries from 1881 to 1885. He has received the Wollaston medal from the Ge logical Society, the Copley medal from the Ro Society, the gold medal of the Royal S New South Wales, and the Swedish or Pole-star. Honorary degrees have bee on him by Oxford, Cambridge, Würzb Bologna, Breslau, Edinburgh, and Dub foreign member of the American a academies, a corresponding member o tute of France and of the Berlin Acade many other foreign societies.

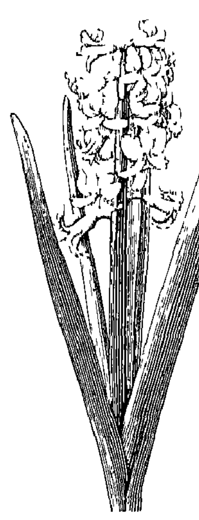
**Huy,** a town of Belgium, is romantically ated amid lofty rocks on both banks of the Meuse, 19 miles SW. of Liége by rail. Its citadel (1822), whose works are partly excavated in the solid rock, commands the passage of the river. The church of Notre Dame, a graceful Gothic edifice, was begun in 1311. In the vicinity are iron-works and coal-mines, and the manufactures include paper, leather, beer, spirits, &c. Pop. (1876) 11,774; (1885) 13,403. Peter the Hermit founded here the former abbey of Neufmoustier (*Novum Monasterium*), and here in 1115 he died. Huy has been frequently besieged.

**Huygens,** CHRISTIAN, one of the great philosophers of the 17th century, was born at the Hague, April 14, 1629, and was the second son of Constantine Huygens, poet, diplomatist, and secretary to the Prince of Orange, who was knighted by James I. of England in 1622. Huygens studied at Leyden and Breda. His first work, *Theoremata de Quadratura Hyperboles, Ellipsis, et Circuli* (1651), is an example of that powerful geometrical talent which lay at the foundation of all his scientific achievements. Soon after this he constructed the pendulum-clock, following out the idea first suggested by Galileo (see HOROLOGY). A complete description of Huygens' instrument is contained in his great work, *Horologium Oscillatorium* (1657). This work contains expositions of many of the cases of constrained motion, especially those applicable to the construction of timekeepers. Huygens also developed and gave precision to the investigations of Galileo upon accelerated motion under the action of gravity; and there is no doubt that to the clearness of his demonstrations his great successor, Newton, in preparing his magnificent development of the principle of accelerating force, was largely indebted. Newton was a student and admirer of his works, and assigns to him, along with Sir C. Wren and Wallis, the distinguished epithet of *hujus ætatis geometrarum facile princeps*. By means of an improved telescope of his own construction, Huygens in 1655 discovered the ring of Saturn and the fourth satellite of that planet. In 1659 he published an account of these discoveries in a work entitled *Systema Saturnium*. In the end of this work the Micrometer (q.v.) is described. In 1660 Huygens visited England, where he was admitted a member of the Royal Society. He discovered the laws of collision of elastic bodies about the same time as Wallis and Wren, and also made a material improvement in the air-pump. But his most important discoveries are in the department of optics: he it was who first propounded and developed what is now known as the undulatory theory of Light (q.v.), and he is the discoverer of Polarisation (q.v.). The 'principle of Huygens' is a part of the wave-theory. In 1666 Huygens received an invitation to settle in France, with the promise of a pension from Colbert, then all-powerful in that country. He repaired to Paris, where he remained till 1681, having been admitted to the membership of the Royal Academy of Sciences; but alarmed at the danger which seemed impending over the Protestants, he returned to his own country. After his return he still continued his favourite pursuits till his death at the Hague, 8th June 1693. new edition of his Latin, Dutch, and French ks, under the title of *Œuvres Complètes*, has issued since 1882 by the Amsterdam Academy lengths of Luther.

kim, he e, JAN VAN, Dutch painter, was born customary um on 15th April 1682, and studied forward father, a landscape-painter. Jan too Reformatidscapes, purely conventional and arti-A set style. But his fruit and flower pieces are taincuished for their exquisite finish, only inferior Th an Heem's in breadth and boldness. He died at Amsterdam on 8th February 1749.

**Huzvaresh.** See PEHLEVI.

**Hwen-thsang,** or HIOUEN-THSANG, a Buddhist monk of China, who was born near Honan about 605, and who in 629 set out on a pilgrimage to India, travelling by way of the Deserts of Gobi, Tashkend, Samarcand, Bamian (q.v.), and Peshawar. He remained in India a period of thirteen years (631–44), visiting the sacred places connected with his religion, and studying its sacred books. He died in 664 in a convent at Chang-ngan (now Singan). Owing to the many curious notices he gives of matters which came under his observation, and the high degree of trustworthiness which his narrative possesses, his memoirs are regarded as one of the most important works on the history of India in general, and of Buddhism in particular, during the period stated. The account of his travels was written, not by himself, but under his supervision, and was completed in 648. According to a remark added to the title in the imperial Chinese edition, the work would seem to have been translated from Sanskrit into Chinese; but this can only mean, as Stanislas Julien observes, that the fundamental part of the work relating to history, legends, &c., was taken from Hindu sources. Besides this book, there exists a biography of Hwen-Thsang written by two of his disciples. Both works were translated into French by Stanislas Julien (Paris, 1853 and 1857–58), and an abstract of these by H. H. Wilson appeared in the 17th volume of the *Journal of the Royal Asiatic Society*. See also *Hiuen Tsiang* in Trübner's Oriental Library (1888).



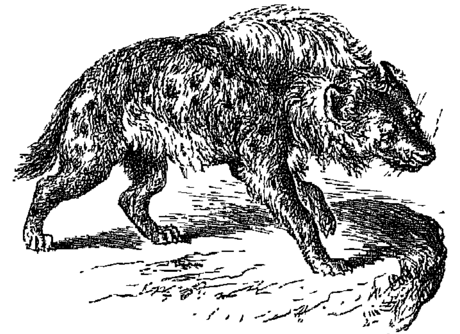
Hyacinth (*Hyacinthus orientalis*).

**Hyacinth** (*Hyacinthus*), a genus of plants of the natural order Liliaceæ; bulbous-rooted plants with corolla-like, bell-shaped, 6-cleft perianth, six stamens fixed in the tube of the perianth, and dry capsular fruit. The flower was fabled to have sprung from the blood of the beautiful Spartan Hyacinthus, beloved of Apollo and Zephyrus. Zephyrus, jealous because Hyacinthus favoured Apollo, caused Apollo's quoit to strike and slay the beauteous youth while the two were at play.—The Oriental Hyacinth (*H. orientalis*), one of the most favourite of florists' flowers, is a native of Asia Minor, Syria, and Persia. It is now naturalised in some parts of the south of Europe. It has broad linear leaves, and a scape with a raceme of many flowers pointing in all directions. The flowers in cultivation exhibit great variety of colour, chiefly blue, purple, and white. They are very beautiful and very fragrant. The fragrance is strongest about or after eleven o'clock at night. Among cultivated hyacinths are many with double flowers. The hyacinth has been cultivated from a remote period. It was introduced into Europe, probably by the Dutch, about the beginning of the 16th century, soon after the revival of commerce, when the traders of Holland carried their merchandise to the eastern shores of the Mediterranean and the Archipelago. It was very little known in Britain till towards the beginning of the 17th century, but soon after its cultivation had become a passion with the wealthy, as it had for some time been with the Dutch. Extravagant prices—as much as £200—were paid for a single bulb of varieties having special or rare merits. This passion declined towards the middle of the 18th century, and the cultivation of the hyacinth became very much depressed. In recent years, however, it has been very much extended, and forms one of the principal industries of florists around Haarlem, which is and always has been the centre of the Dutch bulb trade; but their efforts are now directed with the view of meeting the demand of the million rather than the special requirements of the fanciful wealthy few. Hyacinth bulbs, planted in pots, readily produce beautiful flowers; and flowers almost equally beautiful are obtained—for one year only, however—by placing them in water in hyacinth-glasses, in which they form a favourite ornament of apartments in winter and early spring. The cultivation of hyacinths in the open ground is much more difficult, their early growth being liable to be destroyed by adverse weather. New varieties are raised from seed. Several other species of hyacinths are natives of the south of Europe, Africa, &c.—The Grape-hyacinth and Globe-hyacinth, frequently cultivated as garden flowers, are now referred to the genus Muscari.—A common British plant, growing in woods and copses, with beautiful blue flowers very like those of the oriental hyacinth, but all drooping to one side (*H. non-scriptus*, also known as *Scilla nutans*, *Endymion nutans*, and *Agraphis nutans*), is sometimes called the Wild Hyacinth, and sometimes the Blue-bell (q.v.). The bulbs have been used for making starch.—The name hyacinth is also given to varieties of garnet, topaz, sapphire, and zircon.

**Hyacinthe,** PÈRE, is the former monastic name of CHARLES LOYSON, born at Orleans, 10th March 1827. He studied at St Sulpice, and in 1851 becoming priest, taught philosophy and theology at Avignon and Nantes. Subsequently entering the order of the Carmelites, he became known as a powerful preacher, and gathered crowded and enthusiastic audiences of all ranks of society to the Madeleine and Notre Dame in Paris. Almost as remarkable as his eloquence was the boldness with which he denounced existing abuses in the church; and Archbishop Darboy defended him against the accusations of the Jesuits till in 1869 the General of his order imposed silence on him. Hyacinthe replied by a letter in which he called for a thorough reform of the church, and was excommunicated. Relieved from monastic vows by the pope, he became a secular priest under the name of the Abbé Loyson. He protested vigorously against the Infallibility Dogma; but although he attended the 'Old Catholic' Congress at Munich, and on visits to the United States and England fraternised with Protestants, he always declared his intention to remain in the Catholic Church, trying to obtain reforms, such as the liberty of marriage for the clergy. In 1872 he married an American lady. In 1873 he was chosen curé of a congregation of Liberal Catholics at Geneva, but soon left them, finding them to be 'neither liberal in politics nor Catholic in religion.' He has published a number of sermons and lectures, and in 1879 established a 'Gallican' congregation in Paris.

**Hyades,** in Greek Mythology, the nurses and guardians (3, 5, or 7 in number) of young Dionysus. Zeus converted them into stars and transplanted them to the heavens, where they form the head of the constellation Taurus. Their rising with the sun was held in Greece to mark the beginning of the rainy season.

**Hyæna,** a genus of digitigrade carnivorous quadrupeds, included in the genus *Canis* by Linnæus, but now referred to the Æluroid division of the Carnivora, of which, however, it is a somewhat aberrant member, forming with *Proteles* (q.v.) a sub-family, Hyænina. Hyænas have six incisors and two canine teeth in each jaw, five molars on each side in the upper jaw, and four in the under. They seize an object with so firm a hold that, among the Arabs, they are proverbial for obstinacy. The vertebræ of the neck sometimes become ankylosed in old hyænas. The hind-quarters are lower and weaker than the fore-quarters of the body, so that hyænas move with a shambling gait. The body is covered with rather long coarse hair, forming a mane along the neck and back. The feet have each four toes. The claws are strong, fit for digging, and not retractile. The tail is rather short. Beneath the anus is a deep glandular pouch, contributing much to the offensive odour by which hyænas are characterised. Hyænas eat carrion, as well as newly-killed prey, and are of much use, like vultures, as scavengers, clearing away the last remnants of carcasses that if left to rot would greatly pollute the air. They sometimes attack cattle, especially if they flee, but rarely man, though they sometimes seize children. During the day they hide themselves in caves, old rock-tombs, ruined edifices, &c.; by night they roam singly or in packs in quest of prey. They prowl about towns and villages, and often dig up corpses that have not been very deeply buried. This, together with their aspect and manners, has caused them to be generally regarded with horror, and very exaggerated accounts of their fierceness have been prevalent. Instead of being untamable, as was long the popular belief, they are capable of being very completely tamed, and show an attachment to man similar to that of the dog; they have even been used as watch-dogs. Hyænas are found only in Africa and the south of Asia, not extending to the farthest east of the latter continent.—The Striped Hyæna (*H. striata*) is found both in Asia and Africa, and there are several varieties considerably different in size, colour, &c. The smallest hyænas are of the size of a large dog. The Spotted Hyæna (*H. crocuta*) inhabits South Africa. It is rather smaller than the largest varieties of the striped hyæna, but is more fierce and dangerous. It is called Tiger-wolf by the colonists of the Cape of Good Hope.



Spotted Hyæna (*Hyæna crocuta*).

Besides its ordinary howling, which it em
freely in its nocturnal roamings, this
indulges in an expression of gratificati
passion, resembling hysterical laught
has acquired the name of the Laug
The general colour is ochry gray, wit
tered small round brown spots, and
and feet. The Woolly Hyæna (*H. b*
smaller South African species.

In consequence of the bones which hyæna their dung forms solid yellowish-white balls, compact earthy fracture, the *Album græcum* of the old materia medica. For the Hyæna Dog, see DOG.

**Hya-hya.** See COW-TREE.

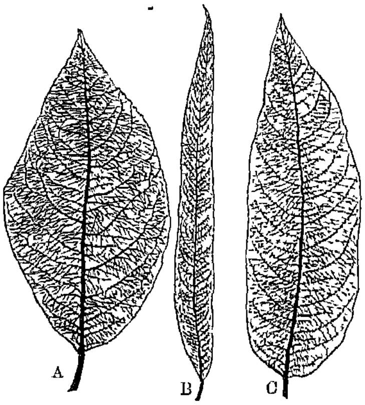
**Hybla,** the name of three cities of ancient Sicily. (1) An old Siculian town situated on the southern slope of Mount Etna, which figured in the second Punic war; its site is fixed at the modern Paterno.—(2) A city founded by the Megarians about 726 B.C., and probably identified with the city called Megara. It was destroyed by Gelon of Syracuse in 481 B.C. It is believed to have stood near the modern Agosta.—(3) A third Hybla lay between Syracuse and Agrigentum. The Hyblæan honey, so much sung by Latin poets, was gathered on the hills near the first two cities.

**Hybrid** (Gr. *hybris*, 'lust'), the offspring of two parents which belong to different varieties, or to different species, or even to different genera. Thus, according to the degree of divergence between the parents, variety-hybrids or mongrels, species-hybrids (the usual application of the term), and genus-hybrids, which are very rare, have to be distinguished. It is also useful to note with Broca that hybridisation may be (*a*) *natural*—i.e. occurring in undisturbed natural conditions, of which we know relatively few cases: (*b*) *incited*—i.e. under direct human control, on which our data as regards animals are chiefly based; and (*c*) *artificial*—i.e. by placing the pollen of one plant on the stigma of another species, or by mixing with the eggs of some animal, say frog or fish, the male elements of some related form.

Among mammals genus-hybrids find illustration in the successful crossing of he-goat (Capra) and ewe (Ovis), the offspring being fertile for several generations, both *inter se* and with the parent-stocks. Species-hybrids are well illustrated in the results of crossing various members of the genus Equus—e.g. male ass and mare, the offspring being a mule; or horse and female ass, the offspring being a hinny. Similarly, dog and fox, dog and jackal, lion and tiger, hare and rabbit, Indian humped cattle and our very different domesticated breeds, and not a few other more or less nearly related forms have been successfully crossed. For such names as 'leopard,' which suggest that crossing occurs or occurred somewhat freely in nature, there is little or no evidence. Nor was there any truth in the supposition that 'Jumarts' resulted from the crossing of bull and mare, or stallion and cow, for Jumarts turn out to have been nothing more than hinnies.

Among birds the common duck (*Anas boschas*) and a pintail (*Dafila acuta*), the common goose (*Anser ferus*) and the very distinct Chinese goose (*A. cygnoides*), goose and swan, canaries and finches, pheasant and hen, and other allied forms are recorded as giving rise to hybrids. Among lower animals hybrids also occur; different species of toad are often seen in sexual union, but the result is unknown; the artificial fertilisation of frog ova with the sperms of other species has at least resulted in the development of hybrid tadpoles; in several fishes hybridisation seems to occur in natural conditions, and artificial fertilisation has been effected even between genera, to the extent at any-rate of starting the development of the ova. The hybrids of two moths (*Bombyx cynthia* and *B.* [illegible]) have been recorded as fertile *inter se* for [illegible]ations; and R. Hertwig has shown that [illegible] conditions the male elements of one echinoderm may incite development in [illegible] another.

*[illegible]tion in Plants.*—Experiment is here [illegible]er, and a large mass of data has rewarded [illegible] investigations of Kölreuter (1761), Andrew [illegible]ght, Dean Herbert, Gärtner, Wichura, Hildebrand, Focke, and others. The subject received careful discussion from Darwin in his work on cross-fertilisation, and also from Nageli, a summary of whose conclusions is available in the English translation of Sachs's *Text-book of Botany*. Only the leading results can be noted here. Hybridisation rarely occurs except between forms known to be related: variety-hybrids occur easily and abundantly; species-hybrids are less, though quite common; genus-hybrids (e.g. between the grasses Ægilops and Triticum, between Rhododendron and Azalea, between Lychnis and Silene) are rare. Besides genetic relationship, some subtle harmony, which we can only call 'sexual affinity,' is essential to successful hybridisation. When one species can be fertilised by the pollen of another, the *vice versâ* relation usually holds good; but sometimes the hybridisation is persistently one-sided. Kolreuter easily obtained seeds from *Mirabilis jalapa* with the pollen of *M. longiflora*, while more than two hundred experiments, extending over eight years, with the pollen of the former upon the stigma of the latter were futile. The results of hybrid-fertilisation exhibit many degrees; thus, the mother-plant may be affected by the strange pollen without seeds being produced, or seeds may be formed which will not germinate, or numerous, vigorous, and fertile hybrids may result. When two kinds of pollen are simultaneously applied to the stigma only one kind is potent. The hybrid is usually intermediate between the two parents, not only in structural features, such as the venation of the leaves and the shape of the flower, but in physiological peculiarities, such as the time of flowering and the mode of coloration. Focke reports a curious case where the crossing of *Anagallis cærulea* and *A. phœnicea* produced hybrids which bore in part the blue flowers of the former species, and in part the reddish flowers of the latter. Hybrids are usually more variable than the parents, and the variation may be towards strength or towards weakness. Since Fairchild, at the beginning of the 18th century, first intentionally produced a cross between *Dianthus barbatus* and *D. caryophyllus*, hybridisation has often been resorted to by gardeners and arboriculturists to produce a strong stock. Very important are the numerous hybrids between European and American vines, some of which are believed to be endowed with greater powers of resisting Phylloxera and fungi than the unaltered European plants possess. There can be no doubt that species-hybrids among plants tend to be sterile, and this the more the wider the difference between the parent plants. Sometimes three or even six individualities have been gradually mingled in a multiple hybrid, and this lessens still more the chance of fertility.



Hybrid Leaves:
A, leaf of *Salix caprea*; B, of *S. viminalis*; C, of hybrid between these two species. (After Wichura.)

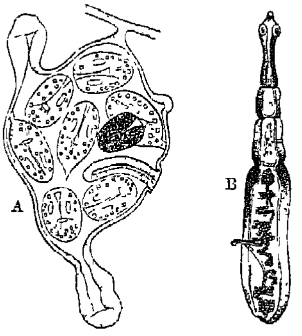
*Character of Hybrids.*—The products of crossing, whether of species or of varieties, are undoubtedly very variable, sometimes for the better—as in many of our domesticated mongrels among both animals and plants—very often on the other hand for the worse. They are often so unstable that they tend rapidly to die out, as has been observed among some human experiments in mingling races. The saying 'God made the white man, God made the black man, the devil made the mulatto,' expresses a feeling as to the frequently inconvenient variability of variety-hybrids, but there is much to be said on the other side. Such a case as sheep-goat hybrids shows how far from accurate is the still prevalent belief that hybrids from widely-separated parent forms must be sterile. We are by no means warranted in saying more than that species-hybrids tend to be sterile so far as we know them, and that it must be remembered is for the most part in conditions of domestication, where the resulting sterility may have been due to confinement, and to prolonged interbreeding, rather than to the hybridisation itself. Nor do the facts allow us to accept the further generalisation that variety-hybrids are always fertile. Not only are there cases of the reverse, but, as Wallace justly points out, the conclusion was again based on domesticated forms, in regard to which it must be noted that the very first essential to their becoming domesticated was that they should continue fertile under changed conditions of life.

*Hybrids in Relation to Evolution.*—The facts of hybridism raise some of the most intricate problems connected with evolution. As only a few general statements can be noted here, the reader is referred to the cited work of Alfred Russel Wallace. (1) Fertility or non-fertility of crosses must not be exaggerated into the test between variety and species, for all species-hybrids are not sterile, nor all variety-hybrids fertile. (2) Fertility depends on some delicate mutual adjustment or complementariness of the male and female elements, and is readily disturbed by external or constitutional conditions. (3) Animals seem to prefer to breed with their like among existing varieties, and in this way it is believed that the 'swamping effects of intercrossing' have been usually obviated, though mutual infertility and geographical separation may also assist in preserving the varieties. (4) Brooks has laid stress upon the fact that both variety and species hybrids are highly variable. In his theory of 'physiological selection,' Romanes has emphasised the importance of mutual sterility in splitting up one species into several. 'Whenever any variation in the highly variable reproductive system occurs, tending to sterility with the parent form without impairing fertility with the varietal form, a physiological barrier must interpose, dividing the species into two parts, free to develop distinct histories, without mutual intercrossing, or by independent variation.' (5) Darwin concluded that 'the sterility or infertility of species with each other, whether manifested in the difficulty of obtaining first crosses between them, or in the sterility of the hybrids thus obtained, was not a constant or necessary result of specific difference, but is incidental on unknown peculiarities of the reproductive system.' Wallace has advanced a step further in his endeavour to show that 'if we accept the association of some degree of infertility, however slight, as a not unfrequent accompaniment of the external differences which always arise in a state of nature between varieties and incipient species, natural selection has the power to increase that infertility just as it has the power to increase other favourable variations.'

See BREED, DOMESTICATION, EMBRYOLOGY, EVOLUTION, REPRODUCTION, SEX, SPECIES; P. Broca, *Jour. d. l. Physiol.*, vols. i. ii. iii.; W. K. Brooks, *Heredity* (Baltimore, 1883); Darwin, *Plants and Animals under Domestication* (Lond. 1868), and *Effects of Cross and Self Fertilisation* (Lond. 1877); Focke, *Die Pflanzenmischlinge* (Berlin, 1881); Geddes and Thomson, *Evolution of Sex* (Lond. 1889); V. Hensen, *Physiol. d. Zeugung*, in Hermann's *Handbuch d. Physiologie* (Bd. vi. Leip. 1881); G. J. Romanes, *Jour. Linn. Soc. XIX.* (1886); J. Sachs, *Text-book of Botany* (Oxford, 1882; cf. his references to Kölreuter, Herbert, Gärtner, Nägeli, &c.), and *Physiology of Plants*, trans. by Marshall Ward (Oxford, 1887); A. R. Wallace, *Darwinism* (Lond. 1889); Wichura, *Bastardbildung im Pflanzenreiche* (Breslau, 1865).

**Hydaspes.** See JHELUM.

**Hydatid** (from the Greek *hydatis*, 'a watery vesicle'), a term applied to the bladder-worm (*scolex*) stage of certain tapeworms, but particularly to that of *Tænia echinococcus*, found especially in man and monkeys, ox and swine, in liver, lungs, or almost any organ. The bladder-worm (*Echinococcus veterinorum*) is often very conspicuous, from the size of a pea to that of a child's head, weighing in some cases 12 to 30 lb., and notable among bladder-worms for its prolific asexual multiplication. From the inner surface, in numerous special brood-capsules of the size of millet-seed, sometimes hundreds of 'heads' are budded off; while daughter-bladders may also be produced externally. The adult tapeworm is small, and lives socially in the intestines of dog, jackal, or wolf. It is from the dog being kept too much about the house or person that the eggs which give rise to the dreadful Echinococcus find their way to man. The disease is known in most countries of Europe, but is commonest in Iceland. The term hydatid is sometimes extended to other bladder-worms—e.g. the 'stagger-worm' (*T. cœnurus*) of the sheep, or in medicine to serous cysts which have nothing at all to do with parasites. See TAPEWORM; and for a very full discussion of Echinococcus, see Leuckart's *Parasites of Man* (trans. by W. E. Hoyle, vol. i. Edin. 1886).



A, brood-capsule of *Echinococcus veterinorum*, with fully-formed and rudimentary heads; B, adult *Tænia echinococcus*.

**Hyde**, an important manufacturing town of Cheshire, 7 miles ESE. of Manchester, and 5 NE. of Stockport. Standing in a coalfield, and enjoying ample facilities of communication by road, rail, and canal, it has risen from a mere village to a considerable town, which in 1881 was incorporated as a municipal borough. Cotton is of course the staple manufacture; then come the felt-hat industry, engineering, boiler-making, &c. Th[illegible] town-hall is a handsome building. Pop. (18[illegible] 1806; (1861) 13,722; (1881) 28,629.

**Hyde,** EDWARD. See CLARENDON [illegible]

**Hyderabad** (*Haidarábád*), or th[illegible] DOMINIONS, a great native or feuda[illegible] India, occupies the greater part of [illegible] proper or central plateau of southern [illegible] tween the provinces of Madras and Bombay. [illegible] 81,807 sq. m. (excluding the British assigned [illegible] tricts of Berar, q.v.); pop. at census of 1881 (the first taken), 9,845,594. About a tenth only are Mohammedans, found mainly in the capital, though the Nizam and state are Mohammedan. Telugu, Kanarese, and Marathi are the principal languages spoken. Education is making rapid strides; during the three years previous to 1889 the number of schools nearly doubled, and the pupils increased from 11,740 to 27,700. The surface is a slightly-elevated tableland. The principal rivers are the Godavari, with its tributaries the Dudna, Manjira, and Pranhita; and the Kistna (Krishna), with its tributaries the Bhima and Tungabhadra. The soil is in general very fertile, but poorly cultivated; yet, wherever it receives moderate attention, it yields harvests all the year round. The products are rice, wheat, maize, mustard, castor-oil, sugar-cane, cotton, indigo, fruits (including grapes and melons), and all kinds of kitchen vegetables. The pasturages are extensive, and sheep and horned cattle are numerous. The climate is good on the whole.

The mean temperature of the capital, Hyderabad, in January is 74° 30', and in May 93°. The exports are cotton, oil-seeds, cloth, hides, metal wares, and agricultural produce; salt, grain, timber, European piece-goods, and hardware are imported. The railway from Madras to Bombay intersects the south-west part of the state. The state revenue is about £4,000,000 a year; and there is an army of 13,000 infantry and 1400 cavalry, besides a large force of irregulars (possibly some 48,000 constitute the military force).

In 1687 the territory long known as the Nizam's Dominions became a province of the Mogul empire; but soon after 1713 the governor or viceroy of the Deccan, Asaf Jah, with the title of *Nizam-ul-Mulk* ('regulator of the state'), made himself independent. After his death, in 1748, two claimants appeared for the throne, his son Nasir Jang, and his grandson Muzaffar Jang. The cause of the former was espoused by the East India Company, and that of the latter by a body of French adventurers under General Dupleix. Then followed a period of strife and anarchy. In 1761 Nizam Ali obtained the supreme power, and after some vacillation signed a treaty of alliance with the English in 1766. He aided them in the war with Tippoo, sultan of Mysore, and at the termination of that war, in 1799, a new treaty was formed, by which, in return for certain territorial concessions, the East India Company bound itself to maintain a subsidiary force of 6000 men for the defence of the Nizam's dominions. Another treaty was concluded in 1853. The Nizam, who in point of rank is the first Mohammedan ruler in India, remained faithful to the British during the mutiny of 1857–58 (see JUNG, SIR SALAR). The assigned districts (see BERAR) were in 1861 given in trust to Britain on account of unpaid and increasing debts; the surplus revenue being returned to the Nizam.

**Hyderabad** (*Haidarábád*), the capital of Hyderabad state, stands on the right bank of the Musi, at an elevation of 1700 feet above the sea, by rail 390 miles NW. of Madras. It is 6 miles in circumference, and is surrounded by a stone wall, flanked by bastions. In 1881 the pop. was 123,675; and with suburbs, 354,962. The populace consists [illegible] very varied elements, and is full of warlike spirit, [illegible] every one carrying weapons. The street [illegible]ture is uninteresting. The palace of the [illegible] though architecturally of no great import-[illegible] vast size. Hyderabad is one of the most [illegible] strongholds of Mohammedanism in India, [illegible] mosques are numerous. The principal [illegible] fashioned after the model of the Great [illegible] Mecca; in the interior are fine mono-[illegible] granite columns, and outside the building is [illegible] by very lofty minarets. Another remarkable edifice is the Char Minar or College, with four minarets resting on four connected arches, at which the four principal thoroughfares converge. On the opposite side of the river is the British Residency, a magnificent pile, with the finest staircase in India; it stands in the midst of fine ornamental gardens, and communicates with the Nizam's palace by a bridge with eight spacious arches of squared granite. The neighbourhood boasts of wild and picturesque scenery, and abounds with huge tanks and beautiful gardens.—Secunderabad (*Sikandarábád*) is a British military cantonment (pop. 1881, 74,124) 6 miles NE. of Hyderabad.

**Hyderabad**, the historical capital of Sind, and chief city of a district, stands 3½ miles E. of the left bank of the Indus. Pop. (1881) 48,153, of whom 21,878 were Mohammedans. The town is the main centre of postal, telegraphic, and road communication for the province, though the Sind railway, terminating at Kurrachee, is on the other side of the Indus. It is famous for the manufacture of silks, gold-work, pottery, lacquered ware, and arms of various kinds. There is now a plentiful water-supply from the Indus. As against a native force it is tolerably strong, occupying a somewhat steep height, and having a rampart flanked by round towers.

**Hyder Ali** (*Haidar Álí*), ruler of Mysore, and one of the greatest Mohammedan princes of India, was born in 1728. His grandfather was a wandering fakir; his father a constable of a district in Mysore. Hyder spent his youth in idleness, though occasionally doing military service; but in 1749 his bravery at a siege attracted the notice of the maharajah of Mysore's minister. He soon became in all but name ruler of the kingdom; and in 1759 he dispossessed his master, allowing him to retain his title, while he himself took that of *daiva*, or regent. He then conquered Calicut, Bednor, Kananur, and other neighbouring states; and in 1766 his dominions included more than 84,000 sq. m. He withheld the customary tribute from the Mahrattas (q.v.), and carried on an ultimately successful war against them. He waged two wars against the British, in the first of which (1767–69) he was practically successful, and signed a treaty under the walls of Madras, which provided for a kind of alliance. When Hyder was defeated by the Mahrattas in 1772 he claimed English support; and on the refusal of the Madras government to fulfil what he believed to be the treaty obligations, he became the bitter enemy of the English. Taking advantage of the war between the English and French (1778), he and his son and successor, Tippoo Saib, descended like a thunderbolt into the Carnatic, totally routed two English commanders, and ravaged the country to within forty miles of Madras; but he was ultimately defeated in three battles by Sir Eyre Coote. He died suddenly, still in alliance with the French, in December 1782, and was succeeded by his son Tippoo Saib.

**Hydnora**, a genus of parasitic plants belonging to the order Cytinaceæ, which consists entirely of root-parasites. *Hydnora africana* is a South African species parasitic on the roots of fleshy Euphorbiæ and other succulent plants; it has a putrid smell, but is roasted and eaten by the natives, and is also used for tanning.

**Hydnum**, a genus of fungi belonging to the sub-order Hymenomycetes, order Basidiomycetes, and having the under side of the *pileus* covered with soft spines which bear the spores. The species are numerous, some of them British; among these is *H. repandum*, more common in some parts of the continent of Europe, and much used as an esculent in France, Italy, and Germany. It grows chiefly in pine and oak woods.

**Hydra**, a Greek island, lies 4 miles from the coast of the Peloponnesian department of Argolis and Corinth. It is a narrow rocky ridge, 11 miles long, 1960 feet high, and 20 sq. m. in area. The shores are rocky and steep, and the interior is destitute of vegetation and of water. On the north-west coast is the seaport of Hydra (6446). The 7342 islanders, mostly of Albanian origin, make excellent seamen, and carry on cotton and silk weaving, tanning, shipbuilding, sponge-fishing, and commerce. The island was uninhabited in ancient times. Previous to the war of Greek independence the Hydriotes numbered more than 28,000, and were considered the richest people in the archipelago. They enjoyed a large share of the carrying-trade in the Black Sea and the Mediterranean, and traded to England, the Baltic, and even America. In the war they took a most active and conspicuous part; but on the restoration of peace the island lost much of its former prosperity, being outrivalled by Syra.

**Hydra**, a fabulous monster of the ancient world, said to have inhabited the marshes of Lernæa, in Argolis, not far from the sea-coast. Accounts vary both as to its origin and appearance. Some make it the issue of Styx and the Titan Pallas, and others, of Echidna and Typhon. It is represented as having several heads, which immediately grew up again as often as they were cut off. The number generally ranged from seven to nine, though Simonides gives it fifty, and some historians a hundred, and even more. Its mouths, which were as numerous as its heads, discharged a subtle and deadly venom. The destruction of this reptile was one of the twelve labours of Hercules.

**Hydra**, a fresh-water polyp, the simplest and most familiar representative of the class Hydrozoa (q.v.), sub-kingdom Cœlenterata (q.v.). The animal consists of a tube, varying from $\frac{1}{4}$ to $\frac{3}{8}$ inch in length, closed at the proximal end by an adhesive plate (pedal disc), whereby it is commonly attached to some water weed; at the other (distal) extremity is the mouth, at the apex of a blunt cone (hypostome), round whose base arise from six to eight tentacles. These are slender tubes closed at the end, but continuous internally with the main cavity of the animal; they have a warty appearance and, according to their degree of contraction, may be either small rounded nodules or stretch out to several times the length of the body. The prey, which is benumbed by the thread-cells to be presently described, is drawn by the tentacles into the mouth. The body-wall consists of three distinct layers: I. The Ectoderm, or outer covering, consists of the following kinds of cells: (1) covering cells in a single layer, subconical, with the broader ends outwards. (2) Muscle-cells, whose base forms a filament, disposed longitudinally. (3) Interstitial cells, small, rounded and placed in groups between the bases of the larger cells. (4) Cnidoblasts, so called because they contain the thread-cells (cnidocysts, nematocysts). These latter have rather a complicated structure; they consist of an ovoid sac, at the outer end of which the wall is invaginated or tucked in to form a long tube coiled up like a string: the commencement of the invaginated portion contains some pointed barbs, the end is filiform and pointed. The young cnidoblasts, in which the development of the thread-cells is just beginning, are situated deeply among the interstitial cells; when mature they are placed on the surface, and form noticeable prominences between the covering-cells; the cnidoblast remains as a sharply-defined capsule round the thread-cell, and near the aperture of invagination it gives out a little process (cnidocil), which seems to serve the purpose of a trigger, for upon touching it the tube contained in the thread-cell is suddenly everted, and then presents the appearance of a long pointed filament, with barbs, disposed in circles of three each, at its base. It is, however, only certain forms of irritation which produce this effect; it seems to be under the control of the nervous system. (5) Nerve-cells, with numerous processes, some of which are continuous with the cnidoblasts. (6) Glandular cells, which are restricted to the pedal disc. II. The Endoderm, or internal layer, consists of three kinds of ciliated cells: (1) a layer of large cells which often contain granules of greenish matter resembling that of leaves (chlorophyll). They have the power of throwing out processes (pseudopodia) during digestion, and almost always have empty spaces or vacuoles in them; they may furthermore give rise to muscular filaments, both circular and longitudinal. (2) Small glandular cells in the hypostome. (3) Glandular cells with vacuous spaces at the base of the body-cavity. III. The Mesoderm is a thin structureless lamella, separating the ectoderm and endoderm.

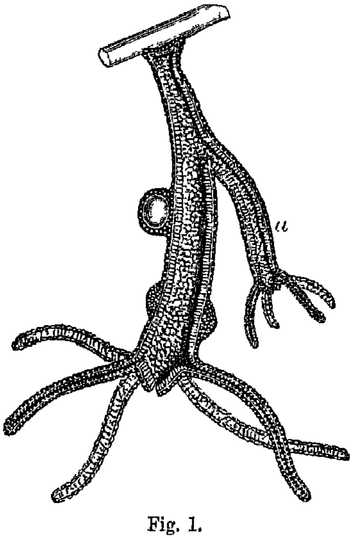


Fig. 1.
Semidiagrammatic longitudinal section of an adult specimen, with reproductive organs and a bud (*a*); magnified eight diameters. (After Marshall and Hurst.)

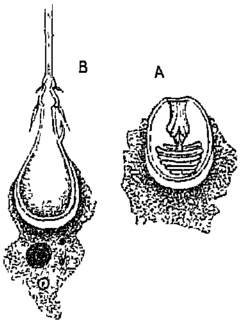


Fig. 2.
A, a thread-cell with the thread not everted; highly magnified.
B, a thread-cell, after the evagination of its contents; highly magnified. The filament, if completed on the scale of the drawing, would have a length of 12 inches. (After Gibson.)

The hydra reproduces by two distinc
(1) asexually by gemmation. When th
is warm and food abundant, a hollov
takes place from the side of the body o
a mouth and tentacles are formed
extremity, and eventually it separate
tion of its base, and commences a
existence. Several buds may form a
these may even produce secondary buds be.
separation from the parent, but this form
colonies is merely temporary. (2) Sexual re
duction takes place when the conditions of h
become unfavourable—e.g. if a hydra which has just begun to bud be placed in a vessel in which food is scarce, sexual organs will be formed and the bud will not improbably be absorbed. The male organs (testes) are conical swellings, situated not far below the tentacles: generally they are more than one in number. They arise by the multiplication of the interstitial cells of the ectoderm, and when mature their contained spermatozoa are shed into the water. The ovum is as a rule single, and is due to the development of one of a mass of interstitial cells; the surrounding cells form a protective capsule which eventually retracts and leaves the most prominent part of the ovum bare to receive the spermatozoa. After this the ovum undergoes segmentation, a hard capsule is formed around it, and it falls to the bottom and there develops into a young hydra. Prior to sexual reproduction the hydra often retires into the shade

of moss or similar dark objects. As regards its reproductive organs it seems most probable that hydra has undergone great modifications as compared with other hydrozoa, and that its simplicity is not primitive but the result of degeneration. The food of hydra consists of organisms more minute than itself, which it is able to paralyse by its thread-cells; after the nutritive portion of these has been extracted the effete portions are ejected through the mouth. The animal can creep slowly upon its disc and swim by the same organ, hanging suspended below the surface of the water; it creeps by bending the body, attaching a tentacle to the surface upon which it rests, and then moving the foot up to the tentacle and refixing it.

Various species of the genus Hydra have been described, as *H. viridis*, *H. fusca*, and *H. vulgaris*. The first is distinguished by the presence of green chlorophyll granules in the cells of the endoderm. It has been maintained that these were algæ living within the cells in a state of Symbiosis (q.v.), but the facts that the green hydra does not lose its colour in the dark, that the coloured bodies have neither nucleus nor cell-membrane, and that they are found in the ovum where they originate from colourless bodies, tend to prove that they are integral parts of the animal.

If a hydra be cut in two, it appears that within certain limits each portion will develop into a complete animal; but the statement so often repeated, as the result of Trembley's experiments, that when a hydra is turned inside out the endoderm and ectoderm will mutually take on each other's functions, and the animal continue to live, is erroneous: the animal will, on the contrary, rectify its position, or, if prevented, it will perish. When a hydra captures a fragment of food too large to be taken into the mouth, it everts the endoderm so as to bring the digestive cells in contact with the food, but it speedily regains its original state; this explains the power it has of rapidly recovering after artificial inversion. Two hydræ can be permanently fused with each other either by pinning them together with bristles or by inserting one inside the other.

List of more important references in addition to the [illegible]dinary text-books of zoology: Kleinenberg, *Hydra* [illegible]1872); Jickeli, *Morphologisches Jahrbuch*, viii. [illegible] Parker, *Proc. Roy. Soc.*, xxx. (1880); Lank[illegible]*e*, xxvii. (1882–83); Korotnev, *Ann. and* [illegible]*ist.* (5) xi. (1883); Ischikawa, *Zeitschr. f.* [illegible] (1890).

**[illegible]gues.** See APERIENTS.

**[illegible]ea,** a genus of plants of the natural [illegible]rangeaceæ, which many botanists make [illegible]ter of Saxifrageæ, distinguished by having [illegible] to six petals, eight to twelve or many stamens, [illegible] more or less inferior ovary, and two to five styles. [illegible] hydrangea the flowers are in cymes, the exterior flowers sterile and dilated. Few species are known, and they are chiefly natives of the southern parts of North America, and of China and Japan. The species popularly known as the Hydrangea (*H. hortensis*) is a native of China and Japan, and has long been in cultivation there as an ornamental plant. It was introduced into Britain by Sir Joseph Banks in 1788, and speedily became very popular, being readily propagated by layers and cuttings, so as to be not only a favourite greenhouse plant, but a frequent ornament of cottage windows. In the south of England, and south-west of Scotland, it endures the open air. It seems almost impossible to water it too freely; and in favourable circumstances it becomes a magnificent shrub. A plant in Devonshire has had 1000 large cymes of flowers expanded at once. The flowers, generally pink, are sometimes blue; the blue colour is owing to peculiarities of soil. Peat and iron ore are said to be productive of blu flowers in the hydrangea. *H. Japonica*, introduce into Europe from Japan by Siebold, is remarkabl for its very large cymes of flowers.—*H. nivea* and *H. quercifolia*, American species, are not unfrequently to be seen in flower-gardens in North America.

Hydrangea (*Hydrangea hortensis*).

**Hydrates** are compounds of water with elements or with other compounds. The term *hydroxide* is one which is sometimes used as a synonym of *hydrate*, and indeed it may be said that we have no certain means of distinguishing the one from the other. The distinction between the two is that in the hydrate the water is supposed to be present as water, and without any rearrangement of the molecules, while in the hydroxide the water is considered to have lost its identity, its constituent atoms having entered into new combinations. As a typical example of a hydrate we may instance crystallised sulphate of copper, $CuSO_4,5H_2O$, which contains the water so loosely combined that it is driven off by prolonged heating, and the white anhydrous sulphate, $CuSO_4$, is produced. Here the water is apparently present as water, and necessary to the crystalline form, and is therefore called water of crystallisation. When nitric anhydride, $N_2O_5$, unites with water it forms nitric acid, $N_2O_5,H_2O$ or $HNO_3$, but this is not regarded as a hydrate, because the nitric acid cannot lose the water without also losing its characteristic properties. The whole question is full of difficulties, and is at present quite theoretical; different chemists using the terms above mentioned in different senses.

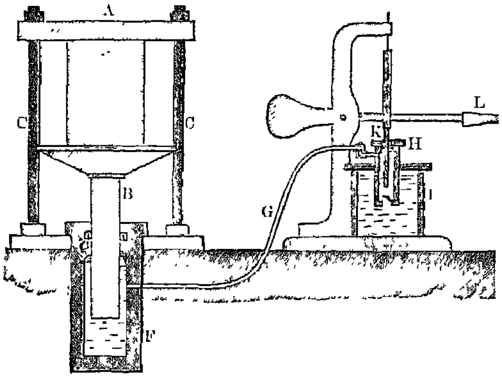
**Hydraulic Cranes.** See CRANES.

**Hydraulic Engines** or **Motors** are often conveniently used when water under a high pressure is obtainable, and where work is intermittently required, as in capstans, winches, &c.; they do not differ essentially from steam-engines. The water acts by difference of pressure—i.e. it is admitted at a high pressure at the beginning of the stroke, and exhausted at a low pressure at the end of the stroke, thus giving a reciprocating motion to the plunger. The velocity of the piston has to be kept low to avoid injurious shocks in suddenly bringing the column of water to rest; since they work under very much greater pressures than steam-engines (usual pressure 700 lb. per sq. in.), they can be much smaller. A common form is the three-cylinder single acting engine: in each cylinder works a plunger; water is admitted by valves behind the plungers and forces them out; at the conclusion of the outstroke the pressure water-supply is cut off, and the exhaust valve opened, allowing the plunger to push the water out of the cylinder on the return stroke, and so on. There are two chambers in the framing, and one passage or port into the bottom of the cylinder; during the working of the engine the cylinder oscillates, and at the right time puts one or other of the two chambers in communication with the interior of the cylinder by means of this port; one chamber is open to exhaust-pipe, the other to supply-pipe. The plungers are connected to a three-throw crank. The great advantage of the single action is that shocks are avoided at the dead centres; the three cranks ensure a very uniform turning force on the crank shaft, and also enable the engine to start in any position.

**Hydraulic Main.** See Gas.

**Hydraulic Mortar.** See Cements.

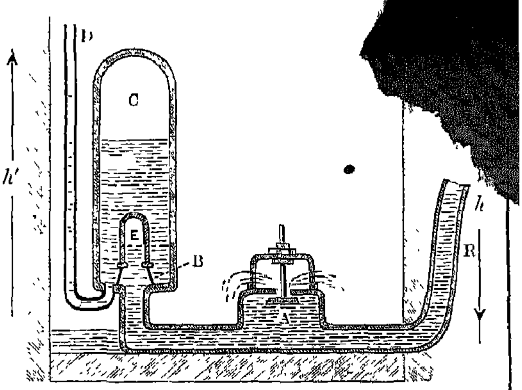
**Hydraulic Press,** often called Bramah's press, from the inventor, *Joseph Bramah* (q.v.), depends for its action on the principle that a pressure exerted on any part of the surface of liquid is transmitted undiminished and equally in all directions through the mass (see Hydrostatics). The annexed figure represents the essential parts of the machine, minor details of construction being omitted. F is a strong cast-iron or cast-steel cylinder, open at the top; B is a plunger or ram which fits watertight into the cylinder; to prevent leakage a leather ring U-shaped in section is placed in the cavity *c*; any water trying to leak out forces the two sides of this ring hard against the piston and the side of the cavity, and the greater the pressure the tighter it keeps. This form of packing is now often replaced by an ordinary stuffing-box filled with hemp packing. A pipe, G, leads from the cylinder to a force-pump, H. By means of this pump water can be forced from the tank, T, through the pipe G into the cylinder, thus pushing the plunger or ram, B, upwards. The ram carries on its top a platten or table, on which the bales, &c., to be pressed are placed; the rising of the platten presses them against the entablature or upper plate, A, which is held in position by the columns C. The bale can thus be squeezed to any extent desired.



Hydraulic Press.

The power of the press is readily calculated; let the diameters of the pump-plunger, K, and ram, B, be $d$ and D inches respectively, then any downward pressure on K becomes an upward pressure on B magnified $\frac{D^2}{d^2}$ times. Suppose, for instance, that the pressure on K was 500 pounds, and that the diameters are 1 and 10 inches respectively, then the upward thrust would be $500 \times \frac{10^2}{1^2} = 50{,}000$ pounds; very enormous pressures are therefore readily obtained, and in consequence of the slow motion there is extremely little waste of power in friction. It is thus a very efficient mechanism. The pump can either be a hand-pump worked by a lever, L, as in sketch, or it may be worked by a steam-engine, as is the case in the modern powerful presses. The enormous multiplying power of this contrivance has led to its most extensive use; for example, compressing cotton and wool bales, &c., expressing oils, bending iron plates and bars, lifting heavy weights (lifts and hoists), raising into position bridge-girders (hydraulic jacks), &c. Presses of enormous power are now superseding the huge steam-hammers in large steelworks, obviating the unpleasant vibrations and ensuring sounder metal.

**Hydraulic Ram,** a simple and conveniently applied mechanism, by which the energy of water falling from a height, *h*, can be made available to force a portion of itself to a greater height, *h'*. There is a supply-reservoir, fed, say by a spring, from which a strong pipe, R, conducts the water to the ram at a lower level. The ram has two valves, one, A, opening downwards and inwards, the other, B, opening upwards and outwards; the weight of these valves is such that when the water is at rest its normal pressure is unable to keep them from falling, so that in this condition A would be open and B shut. A cottar on the rod of A keeps it from opening more than a certain amount, and this can be adjusted; the valve B opens into an air-vessel, C, from the bottom of which the delivery pipe, D, leads away. The action is as follows: the water flows from the reservoir through the pipe R, and rushes out through the now open valve A away to the waste-pipe; in doing so it acquires considerable velocity, and its pressure therefore on the under side of the valve A increases, and finally becomes great enough to close it. The flow of the water being thus suddenly checked, produces a great reaction, and by its momentum opens the valve B, and forces a portion of the water into the air-vessel C; the energy being expended, the pressure falls again, B closes, and A opens once more, *enabling the water to rush out to the waste-pipe*, and so the whole operation is repeated. The two valves thus alternately open and close, and water is delivered each time into the air-chamber, C [illegible] air in which being compressed acts as an air-c[illegible] keeping up a constant delivery through th[illegible]



Section of Hydraulic Ram.

The small air-vessel, E, is for diminishing the shocks, and has a small relief valve in it to admit air when necessary; it is self-acting. The hydraulic ram was an invention of Montgolfier (1797), but has been greatly improved; its mechanical efficiency is good, and for raising small quantities of water, such as are necessary for the supply of single houses, farm-yards, &c.—where water at the lower level is plentiful and cheap, it is a most useful piece of mechanism. It can even be made to work a pump, and so to deliver a supply of pure water when the motive water is muddy or impure.

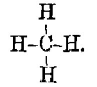
**Hydraulics.** See HYDROMECHANICS.

**Hydrides.** This term is applied both to combinations of hydrogen with metals, and to similar combinations with organic or compound radicals. Hydrogen forms hydrides with a number of the metals, as, for instance, arsenic, antimony, copper, and potassium. The first two of these are the well-known gases, arseniuretted hydrogen, $AsH_3$, and antimoniuretted hydrogen, $SbH_3$. In the case of organic radicals, the hydride of ethyl, $C_2H_5H$, for instance, was at one time supposed to be a different substance from dimethyl, $CH_3CH_3$, but these were eventually proved to be identical, so that the term hydride, in this sense, is now obsolete.

**Hydrobromic Acid,** (1) *gas*, HBr, invisible, pungent, acid reaction, fumes in moist air, liquid at − 69° C., solid at − 100° C.; prepared from a bromide *plus* phosphoric acid, or phosphorus tribromide *plus* water. (2) Aqueous *solution*, analogous to commercial hydrochloric acid, is weakened by boiling until HBr sinks to 47 per cent., then distils unchanged. See BROMINE.

**Hydrocarbons** belong to the department of organic chemistry, and may be shortly defined as compounds of carbon and hydrogen, and nothing else. Despite their apparently simple nature, they are frequently very complex, and exist in such numbers as to bewilder the beginner in chemical study. Fortunately, they can be gathered into groups, each having distinctive characters, and the members of which are closely related to each other. The chief of these are the Paraffins, the Olefines, the Acetylenes, the Benzene (q.v.) series, and the Anthracene (q.v.) group.

The *Paraffins* are found in natural petroleum as well as in the products of the destructive distillation of coal, and are known as *saturated hydrocarbons*. By this is meant that the carbon present is already saturated (so to speak) with hydrogen, and has no tendency to unite with other elements or molecules. Graphically, carbon may be represented [illegible] i.e. with four arms, each one of which is [illegible] being united to one atom of hydrogen; [illegible] all four arms are so united, a *paraffin* is [illegible] [illegible]us,

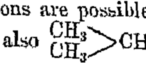


$$\begin{array}{c}H\\|\\H{-}C{-}H\\|\\H\end{array}$$

But, instead of the [illegible]om of hydrogen, one arm (or all the arms) [illegible] be engaged by such a group as $CH_3$, so that we [illegible] another paraffin, $CH_3—CH_3$. Thus we go on [illegible]rming a series, each member of which differs from the preceding one in having an extra $CH_2$. Thus:

$CH_4$ Methane,
$CH_3—CH_3$ or $C_2H_6$ Ethane,
$CH_3—CH_2—CH_3$ or $C_3H_8$ Propane,

and so on indefinitely. It will, however, be noticed that when we pass to a higher member than propane, by replacing an atom of hydrogen by $CH_3$, we may do so in two ways, according as the atom replaced is in the $CH_3$ group at either end, or the $CH_2$ group in the centre. The result is that two hydrocarbons are possible—viz. $CH_3—CH_2—CH_2—CH_3$, and also



$\begin{array}{l}CH_3\\CH_3\end{array}\!\!>CH—CH_3$. In like manner, as we proceed further, wider scope is given to us, the result being that when Tridecane, $C_{13}H_{28}$, is reached, it is theoretically possible to recognise 802 such bodies, all having the same percentage composition, but differing more or less in characters. Many of these isomers are already known. The paraffins are characterised by their indifference to chemical action, being unacted on by caustic potash, sulphuric or nitric acid. The general formula of the paraffins is $C_nH_{2n+2}$, where *n* represents the number of atoms in the formula.

The *Olefines*, $C_nH_{2n}$.—The chief of these are Ethyline, $C_2H_4$, Propylene, $C_3H_6$, Butylene, $C_4H_8$, Amylene, $C_5H_{10}$, &c.; and it will be observed that in all of them the percentage composition is identical, and that each member differs from the lower one by the addition of $CH_2$. When acted on by chlorine, bromine, or iodine they readily form oily liquids, such as Dutch liquid, and, generally speaking, they markedly differ from the paraffins in the readiness with which they unite with other bodies.

**Hydrocele** (Gr. *hydor*, 'water,' and *kēlē*, 'a swelling') is a dropsy of the tunica vaginalis, the serous membrane investing the testis. It occurs as a smooth, pear-shaped swelling, painless, but sometimes causing a slight uneasiness from its weight. The quantity of fluid in the sac may amount to 40 ounces. Hydrocele may occur as a result of acute inflammation, but it most commonly comes on without any apparent local cause. It is most frequently met with about or beyond the middle period of life, and generally in persons of feeble power, or with a tendency to gout; sometimes, however, it occurs in young children, either in the same form as in adults, or as what is termed *congenital hydrocele*. The treatment may be *palliative* or *curative*. The palliative treatment consists in the use of suspensory bandages, and tapping from time to time. Tapping seldom gives more than temporary relief, the swelling usually regaining its former bulk in three or four months. The curative treatment consists in setting up inflammation in the tunica vaginalis, by the injection of tincture of iodine, so as to obliterate the cavity, or by excision of the whole or part of the sac.

**Hydrocephalus.** Under this term, which literally means 'water in the head,' are included three distinct diseases—viz. acute hydrocephalus, chronic hydrocephalus, and spurious hydrocephalus, or, as Dr Marshall Hall termed it, hydrocephaloid disease.

*Acute Hydrocephalus*, or, as it is now generally and more satisfactorily termed, *tubercular meningitis*, is essentially an inflammation of the membranes of the brain due to the presence of Tubercles (q.v.). The occurrence of fluid within the skull or the brain, though frequent, is merely a secondary and subordinate phenomenon. It is an extremely fatal form of disease, common in childhood, much less so during adult life. The symptoms are very variable and perplexing, so that only the barest outline of the most frequent and important can be attempted here. There is usually a premonitory period of some days or weeks, during which the appetite and digestion are disturbed, the disposition is altered either in the direction of listlessness or irritability, the strength impaired, and the body becomes slightly thinner. The first distinct symptom of the disease is usually severe headache, with sickness and feverishness; the pulse is rapid and the temperature raised, but variable. Vomiting very often occurs at this stage, and sometimes a peculiar cry at intervals, which if present is very characteristic.

In this first stage of hydrocephalus, which most commonly lasts two or three days, the symptoms generally are those of excitement. In the second stage the pulse becomes irregular, variable, and often slow. General heaviness and stupor come on. The light, which annoyed the child in the first stage, is no longer a source of annoyance; the pupils become dilated, the power of sight is imperfect or lost, and squinting is almost always to be observed. The little patient now lies on his back in a drowsy condition; and at this period spasmodic twitchings, convulsions, or paralysis may appear. The excretions are passed unconsciously. The second stage may last a week or two, and is often attended by deceptive appearances of amendment, the child not unfrequently regaining the use of its senses for a day or two, but then relapsing into a deeper stupor than before. The symptoms in the third or last stage, which may last only a few hours or may extend to a fortnight, are very similar to those in the second, except that the pulse again becomes very rapid, beating sometimes so quickly that it can scarcely be counted, and gradually gets more and more weak till the patient expires. The characteristic appearances after death are the presence of tubercles in the membranes of the brain, usually near the base, and generally more or less softening of the central part of the brain, with the effusion of serous fluid into the ventricles.

It must not be supposed that the stages described above can be observed in every case. There is, in fact, hardly any disease whose course is so variable and so apt to mislead those observing it. In its earlier stages its recognition is sometimes almost impossible; yet it is only then that any treatment can be expected to be successful. Cold applied to the head, leeching, and purgation sometimes appear to do good; but in the vast majority of cases the disease proves rapidly fatal. Recovery has been proved to take place only in some few exceptional instances.

*Chronic Hydrocephalus* is a perfectly distinct disease from that just described; while the latter is an inflammation, the former is a dropsy. In chronic hydrocephalus a watery fluid collects within the skull, before the bones have united to form the solid brain-case, and by pressure outwards causes them to separate, and increases the size of the head sometimes to an enormous extent. Thus Dr David Monro relates the case of a girl six years old whose head measured 2 feet 4 inches in circumference. While the skull is rapidly enlarging, the bones of the face grow no faster than usual, and the great disproportion of size between the head and the face is at once diagnostic of the disease. This disorder sometimes commences before birth, and almost always in early childhood, before the fontanelles and sutures of the skull have closed. In some rare cases it has occurred later, as, for example, at seven or nine years old, and the closed sutures have opened under the augmenting pressure. When the sutures will not yield, death from pressure on the brain speedily ensues. Most children with chronic hydrocephalus either recover or die in infancy; but a few survive, bearing their complaint to adult life, or even to old age. Blindness, deafness, palsy, and idiocy—one or more—are commonly associated with this disease, but occasionally the intellect and senses are sufficiently perfect for the ordinary requirements of social life.

The results of treatment are generally not encouraging, though sometimes benefit appears to result. It may be attempted by internal remedies or by surgical appliances. The medical treatment most in favour consists in the administration of diuretics, purgatives, and especially mercury, which may be given in the form of calomel in minute doses, and applied as ointment externally. The surgical expedients are bandaging and puncturing the head. The latter has in many cases certainly prolonged life, although the disease has finally conquered. Neither of these means is applicable after the bones of the skull have united.

This disease occasionally occurs in adult or in advanced life, after enlargement of the head has become impossible. Stupor, paralysis, and an inability or unwillingness to speak are in these cases the most prominent symptoms. Dean Swift's death was due to this disease, and it is recorded that during the last three years of his life he remained in a state of silence, with few and slight exceptions.

*Spurious Hydrocephalus* resembles acute hydrocephalus in many of its symptoms, and has often been mistaken for it. Instead, however, of being an inflammatory disease it is a disease of debility, and is due to a deficient supply of blood to the brain. The following are, according to Watson, the distinctive characters of this spurious hydrocephalus: the pale, cool cheek; the half-shut, regardless eye; the insensible pupil; the interrupted, sighing respiration; and the state of the unclosed fontanelle. If the symptoms are those of acute hydrocephalus the surface of the fontanelle will be convex and prominent; while if they are due to spurious hydrocephalus, and originate in emptiness and want of support, the fontanelle will be concave and depressed. The remedies in this disease, which readily yields to treatment, are nourishing diet, small doses of wine or even of brandy in arrowroot, decoction of bark, ammonia, &c.

**Hydrocharideæ**, or HYDROCHARIDACEÆ. See ANACHARIS, and VALLISNERIA.

**Hydrochloric Acid** (sym. $HCl$; equiv. 36·5) is one of the most important compounds in inorganic chemistry. If the two gases which enter into its composition (hydrogen and chlorine) be mixed in equal volumes they will remain without action upon each other if kept in the dark; but as soon as they are brought into direct sunlight they unite with a loud explosion, and hydrochloric acid gas is the result. The principal characters of this gas are that it is colourless, intensely acid, irrespirable, and even when largely diluted is very irritating to the lungs and eyes, and very injurious to vegetation; that it is heavier than air (its specific gravity being 1·2474, air being taken at 1·000); that it can be condensed int [illegible] colourless liquid; that it is very soluble in [illegible] and that it is neither combustible nor a su[illegible] of combustion. When allowed to escape [illegible] air it produces white fumes by conde[illegible] atmospheric moisture. If the air be [illegible] dried no such fumes are apparent.

The solutions of this gas in water [illegible] which was first known as *Spirit of S*[illegible] *Muriatic Acid*, and which is now ter[illegible] *chloric* or *Chlorhydric Acid*. A saturated [illegible] solution of this gas at 40° (4·4° C.) has a spe[illegible] gravity of 1·21, and consists of 1 equivalent of th[illegible] gas dissolved in 3 equivalents of water. It forms a colourless, fuming liquid, which acts as a caustic. On heating it the gas is evolved abundantly until the temperature reaches 230° (110° C.), when there distils over a diluted solution, having a specific gravity of 1·1, and consisting of 1 equivalent of the gas and 8 equivalents of water. It is to these solutions of hydrochloric acid that the term *hydrochloric acid* is far more commonly applied than to the gas itself. They possess the ordinary characters of an energetic acid, and neutralise the strongest bases. The neutralisation is, however, not in consequence of the acid combining with the oxide, but is due to the simultaneous decomposition of the acid and of the oxide, water and a metallic chloride being formed. If M represents the metal the reaction is expressed by the equation $M_2O + HCl = MCl + H_2O$. All metals which at a red heat decompose water also decompose this acid, and cause an evolution of hydrogen, the reaction being expressed as follows: $M + HCl = MCl - H$. Hydrochloric acid gas is a common gaseous volcanic product. Free hydrochloric acid in a very dilute form is also a constituent of the gastric juice of man and animals, and plays an essential part in the digestive process.

Commercial *muriatic acid*—to use the name employed by manufacturing chemists—is made by heating in iron cylinders common salt (chloride of sodium) and oil of vitriol (hydrated sulphuric acid), and condensing the evolved gas in water contained in a series of stoneware Wolffian Bottles (q.v.), the reaction being explained by the equation:

$$\overset{\text{Chloride of Sodium}}{NaCl} + \overset{\text{Oil of Vitriol}}{H_2SO_4} = \overset{\text{Hydrochloric Acid}}{HCl} + \overset{\text{Sulphate of Soda}}{Na_2SO_4}.$$

This commercial acid may contain various impurities—as, for example, iron (which gives it a bright deep yellow colour), the chlorides of sodium and arsenic—the latter being derived from the oil of vitriol—sulphuric and sulphurous acids, chlorine, &c., from which it can be purified to a great extent by dilution and redistillation. 'If pure,' says Miller, 'the acid should leave no residue when evaporated; on saturating it with ammonia it should give no precipitate of oxide of iron; sulphuretted hydrogen should produce no turbidity in it, which would be the case if arsenic, free chlorine, or sulphurous acid were present; and on dilution with three or four times its bulk of water no white cloud of sulphate of baryta should be produced by the addition of chloride of barium.' The presence of hydrochloric acid, or of the soluble chlorides in solution, may be detected by the addition of a few drops of a *solution of nitrate of silver*, which occasions the formation of a white curdy precipitate of chloride of silver, which is insoluble in nitric acid, but dissolves in a solution of ammonia.

Liquid hydrochloric acid (under the name of spirit of salt) was known to the alchemists. Hydrochloric acid gas was discovered by Priestley in 1772; and Davy in 1810 ascertained that it was composed of chlorine and hydrogen. In many [illegible] their properties the analogous acids, hydro[illegible], hydrofluoric, and hydriodic acids, resemble [illegible]loric acid.

**Hydrocotyle.** See PENNYWORT.

**Hydrocyanic Acid,** HCN or HCy, known [illegible]ic Acid, from its having been first [illegible] Scheele in 1782 from the substance [illegible] Prussian or Berlin Blue, is of almost [illegible]est to the chemist, the physician, and [illegible]xicologist.

([illegible]) *Chemistry.*—Pure anhydrous hydrocyanic [illegible]id is a colourless, highly volatile liquid, with a [illegible]ecific gravity of 0·697 at 64° F. It boils at 80°, [illegible]d solidifies into a crystalline mass at 5° F. It possesses a very penetrating odour, resembling that of peach-blossoms or oil of bitter almonds. It burns with a whitish flame, reddens litmus paper slightly (its acid properties being feeble), and is very soluble in water and alcohol. Pure hydrocyanic acid may be kept unchanged if excluded from light, which occasions its *decomposition*, and the formation of a brown substance known as paracyanogen. Hydrocyanic acid is readily obtained by distillation from the kernels of bitter almonds and many kinds of stone-fruit, from the leaves and flowers of various plants, and from the juice of the tapioca plant (*Jatropha manihot*). Anhydrous hydrocyanic acid may be obtained by the action of concentrated hydrochloric acid on cyanide of mercury. The diluted hydrocyanic acid of the British and other pharmacopœias is, however, of more practical importance. It is made (*British Pharmacop.*) by distilling ferrocyanide of potassium with dilute sulphuric acid, and is standardised to a strength of 2 per cent. When kept for any length of time it is extremely apt to decompose.

The ordinary tests for hydrocyanic acid are (1) the peculiar odour; (2) the nitrate of silver test—there being formed a white precipitate of cyanide of silver, which is soluble in boiling nitric acid; (3) the formation of Prussian blue, by adding to the fluid under examination a solution of some proto- and per-salt of iron, by then saturating with caustic potash, and finally adding an excess of hydrochloric acid, when, if hydrocyanic acid is present, we have a characteristic blue precipitate; (4) the sulphur test, which is the best and most accurate that has yet been discovered. To the suspected liquid add ammonia and yellow sulphydrate of ammonium; evaporate the liquid in a watch-glass to dryness, occasionally adding ammonia till the excess of sulphydrate of ammonium is decomposed. Add water, and acidify with hydrochloric acid. If hydrocyanic acid be present the sulphocyanate of ammonium which has been formed gives a blood-red solution on the addition of a ferric salt.

(2) *Medicinal Uses.*—Diluted hydrocyanic acid is used externally as an ingredient of lotions to diminish itching in skin diseases. In 2 to 8 minim doses it is given internally to diminish irritability of the stomach, to relieve gastro-intestinal pain, vomiting, and functional palpitation of the heart. Given by the mouth or by inhalation it is also useful in allaying cough in phthisis, hooping-cough, bronchitis, &c. All these applications depend upon its action in deadening sensory nerves.

(3) *As a Poison.*—Hydrocyanic acid is one of our most energetic poisons, and is frequently employed both for murder and suicide. When a *small* poisonous dose (about half a drachm of the 2 per cent. acid) has been taken the first symptoms are weight and pain in the head, with confusion of thought, giddiness, nausea (and sometimes vomiting), a quick pulse, and loss of muscular power. If death result this is preceded by convulsions and involuntary evacuations. When a *large* dose has been taken (as from half an ounce to an ounce of the 2 per cent. acid) the symptoms may commence in a few seconds, and it is seldom that their appearance is delayed beyond one or two minutes. 'When,' says Dr A. S. Taylor, 'the patient has been seen at this period he has been perfectly insensible, the eyes fixed and glistening, the pupils dilated and unaffected by light, the limbs flaccid, the skin cold and covered with a clammy perspiration; there is convulsive respiration at long intervals, and the patient appears dead in the intermediate time; the pulse is imperceptible, and the respiration is slow, deep, gasping, and sometimes heaving or sobbing.' The patient survives for a longer or shorter period, according to the dose. According to Dr Lonsdale, death has occurred as early as the *second* and as late as the *forty-fifth* minute; the poison acts as a paralysant to the whole nervous system. Death is due to paralysis of the heart in the more rapid cases, and to paralysis of the respiration in those which occur more slowly.

Where the fatal action is so rapid antidotes are of comparatively little value. Chlorine, ammonia, cold affusion, and artificial respiration are the most important agents in the treatment. The first two should be used with great caution, and only by the medical practitioner. Cold affusion on the head, neck, and down the spine is a valuable remedy. Artificial respiration (see RESPIRATION, ARTIFICIAL) should never be omitted.

**Hydrodynamics,** in its complete generality, is the science which treats of the motions and equilibrium of a material system, part or all of which is fluid. In accordance with modern dynamic nomenclature (see DYNAMICS) we should discuss it under the two headings Hydrokinetics and Hydrostatics. The historic usage of the term has, however, so fixed itself that we generally regard hydrodynamics as excluding hydrostatics and as dealing only with kinetic problems. Originally, as the derivation of the words at once show, hydrodynamics and hydrostatics referred only to the motion and equilibrium of liquids; but as our knowledge of the physical properties of all kinds of fluid, liquid and gaseous, increased, it was recognised that they had much in common from a dynamic point of view, and the terms became extended in their application as defined above. Thus the floating of a balloon in air depends on the same hydrostatic principle as the floating of a ship on water. The simpler and some of the more practical problems of hydrostatics will be found treated under that heading. In its practical engineering aspects hydrodynamics is known as hydraulics, including such important subjects as the construction of canals, breakwaters, docks, pumps, water-pipes, water-wheels, and so on, most of which have separate articles to themselves. Here we shall confine ourselves to the scientific principles of the subject, using familiar cases as illustrations.

The study of hydrodynamics has led to the conception of what is called the *perfect* fluid. It may be defined as a substance incapable of resisting the smallest deforming stress. For instance, no portion of such a fluid can resist, even for a moment, a longitudinal pressure if unsupported by a lateral pressure. The logical consequence of this definition is that, if the fluid is at rest, the pressure at a point is the same in all directions; for if it were not so there would be a deforming stress, and therefore a yielding of the fluid, and equilibrium could not exist. By similar reasoning we may show that, if the pressure varies from point to point in a fluid at rest, there must be an external force acting on the fluid in the direction in which the pressure is increasing. Thus, in virtue of gravity, atmospheric pressure decreases as we ascend, and the pressure in the ocean or any other body of water increases as we descend. So long as we are dealing with equilibrium of fluids we meet with nothing inconsistent with the definition of the ideal perfect fluid. Across every interface separating two contiguous portions of the fluid the mutual stress is of the nature of a pressure wholly normal to the interface.

When, however, we pass to cases of fluid motion we find that the properties of the perfect fluid are very far from being realised in nature. The smallest relative motion amongst the different parts of a fluid brings into play mutual stresses which are not normal to the interface between two contiguous portions. These tangential stresses tend to destroy the relative motion, existing only so long as the relative motion exists. They are thus partly analogous to resistances due to friction in the dynamics of solid bodies—hence the term fluid friction (see VISCOSITY) frequently employed to denote the property that discriminates actual fluids from the ideal perfect fluid. Fluid friction, however, differs from friction in one marked particular; it has no significance in static problems. It is wholly kinetic. The gradual stilling of troubled waters, the calming of the wind, the slackening in speed of the water in a stream as we pass from the centre and surface portions towards the banks or bottom are familiar examples of the effects of fluid friction.

Under certain circumstances the tangential stresses thus brought into play not only retard the motion of the more swiftly-moving parts of the fluid, but even accelerate the motion of the more slowly-moving parts. Thus a rapidly-flowing river entering the sea draws along with it a considerable quantity of the original ocean water. The effects of a draught of air are felt far beyond the direct course of the main current. It is impossible, in fact, to mark off clearly the boundaries of a current flowing in fluid of the same kind. In like manner, the eddies formed in the wake of a solid body moving through either air, water, or other fluid could not be produced if it were not for the existence of these tangential stresses. In every case the final result is a dissipation of energy (see ENERGY); but in the majority of cases of practical importance the rate of dissipation is so slow—in other words, the tangential stresses are so small in comparison with the other effective forces acting—that the properties of the perfect fluid go far to explain many hydrokinetic phenomena. Some of these we shall now consider.

It has been already pointed out that the equilibrium of a fluid under the action of gravity or other force depends upon the manner in which the pressure varies in the direction of the force. Now a force has always a definite direction; and consequently in all directions perpendicular to the direction of the resultant force acting at a point in the fluid there can be no variation of pressure. Thus, from any one point we can pass to an infinity of neighbouring points at which the pressure is the same; from each of these again to an infinity of others; and so on indefinitely. We thus arrive at the conception of a surface in the fluid, at every point of which the pressure is the same. Such a surface is called a surface of equal pressure, and one of its essential properties is that it is perpendicular at every point of it to the resultant force there. In the case of fluids at rest under the action of gravity these surfaces are also called level surfaces, and are for all practical purposes essentially horizontal planes. A consideration of these principles leads easily to the conclusion that equilibrium in a fluid mass cannot exist if the pressures at t
points at the same level differ, or if the pres
are the same at two points at different
These two conditions are essentially one
same; and when they are fulfilled,
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which we shall discuss in detail.
(fig. 1) is provided at D, C, E,

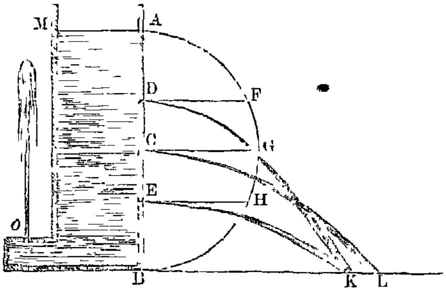


Fig. 1.

which may be closed when desired. Let the vessel be filled with water up to the level MA; then, if the orifice *o*, which looks vertically upwards, is opened, a jet of water will be projected up, and will reach very nearly to the height MA. If it were not for fluid friction and the consequent dissipation of energy the jet would reach the height MA. As soon as the orifice *o* is opened, the water surface there being exposed simply to the pressure of the atmosphere is under the same pressure as the much higher surface MA. Hence a flow takes place and will continue to take place until the surface of the water MA has sunk to the level of the water at *o*. The experiment shows that the jet is projected with a velocity very nearly equal to that which would be acquired by a body falling under gravity from the level AM to the level *o*. This velocity is given by the relation $v^2 = 2gh$, where $g$ is the acceleration due to gravity and $h$ the difference of level mentioned. Similarly, if the orifices at D, C, E are opened, the issuing jets will be projected with speeds whose squares will be found to be very approximately proportional to the differences of level between the upper surface MA and the respective orifices. This may be proved experimentally by constructing the orifices so that the discharge is initially horizontal, and then measuring the range, BK or BL, reached by the several jets. Thus, assuming the law just given, commonly called the theorem of Torricelli, we may show that the square of the range BK is equal to four times the product of the differences in level of the orifice D below A and above B, that is, 4AD · DB. Hence if we describe a semicircle AGB on AB as a diameter, the horizontal lines DF, CG, EH meeting this semicircle will be half the horizontal ranges corresponding to the respective orifices.

The height of the free water surface above the orifice from which the water is issuing is technically called the *head*. The greater the head the greater is the pressure at the level of the orifice, and the more available the water for practical purposes. Part of the head is consumed in overcoming frictional resistances; for well-formed simple orifices about 6¼ per cent. of the whole head is so expended. The discharge from any orifice in a given time will depend obviously on the size of the orifice and on the available head. Experiment shows, however, that for sharp-edged orifices in a wall the discharge is distinctly less than the simple theory would indicate. In such cases the section of the jet is [illegible]ller than the section of the orifices in the ratio was [illegible]t 5 to 8. This is sufficiently explained by [illegible] convergence of the streamlets in the fluid which [illegible] form the jet; and this convergence con[illegible] little distance beyond the orifice, pro[illegible] phenomenon of the *vena contracta* or [illegible]. We have seen how the speed of [illegible] by means of the parabolic path [illegible] speed multiplied by the number of [illegible] chosen interval of time, and by the [illegible] known) area of the orifice gives the [illegible]arge in that interval. This discharge [illegible] easily measured; and thus the data are [illegible]te for finding the effective area of the orifice [illegible] comparing it with the real area. By furnishing [illegible] orifice with a short mouthpiece of the form of [illegible]he contracted vein, we may regard the smallest cross-section of the mouthpiece as the true orifice. In this case the effective area and the real area are the same.

In these simple cases of efflux the energy of efflux is wholly explained as being derived from the hydrostatic head of water. The pressure due to this head is the weight of a column of water of unit-cross-section and of a height equal to the head. Thus, if $\rho$ is the density of the water, so that $\rho g$ is the weight of unit-volume, the pressure $p$ due to a head $h$ is $\rho gh$. Thus, by Torricelli's theorem, $\frac{p}{\rho}$ is half the square of the velocity with which a jet would be projected through an orifice made at a place where the pressure is $p$. Hence we may regard this ratio $\frac{p}{\rho}$ as the energy per unit-mass of water due to the pressure $p$. But if the water is in motion with a speed $v$, its energy per unit-mass is on this account $\frac{1}{2}v^2$. If, further, the particular portion of the fluid considered is at a height $x$ above a certain arbitrarily chosen level, defined as the level of zero potential energy, then its potential energy is $gx$. The whole energy possessed by the moving fluid is built up of these three parts due respectively to pressure, speed, and gravitation, and is given therefore by the expression $\frac{p}{\rho} + \frac{1}{2}v^2 + gx$. Now, in the case of a steady frictionless flow along a determinate channel, the whole energy possessed by any unit-mass of the fluid must be the same; for at some time or other every element passes through the positions occupied at other times by other elements in the same stream-line, and passes through them under the same dynamic conditions. Hence, neglecting the effects of friction, we arrive at the conclusion that the expression for energy just given is constant along any given stream-line. Take, for example, a pipe of uniform bore. If the flow is steady the invariableness of the cross-section requires the speed at every point to be the same. Hence as $x$ diminishes $p$ must increase, so that $\left(\frac{p}{\rho} + gx\right)$ may remain constant. For a horizontal pipe $x$ must be constant, and so of necessity is $p$. Now suppose the tube to be horizontal but of variable section; then, since $x$ is constant, the expression $\left(\frac{p}{\rho} + \frac{1}{2}v^2\right)$ must also be constant. But the speed $v$ varies inversely as the section; hence $p$ must be greatest where the bore is widest and least where the bore is narrowest. In other words, the cross-section and pressure increase together and diminish together. A familiar illustration of this is shown in fig. 2, in which water is escaping from a short cylindrical nozzle A. The contracted vein occurs at *c*, so that, the velocity being greater there than at the open end of the tube, the pressure is less. But the pressure at A is the atmospheric pressure; and, consequently, if a tube be led from *c* to the vessel of water V, the water will be pushed up to some point *b* by the excess of the atmospheric pressure over the pressure at *c*.

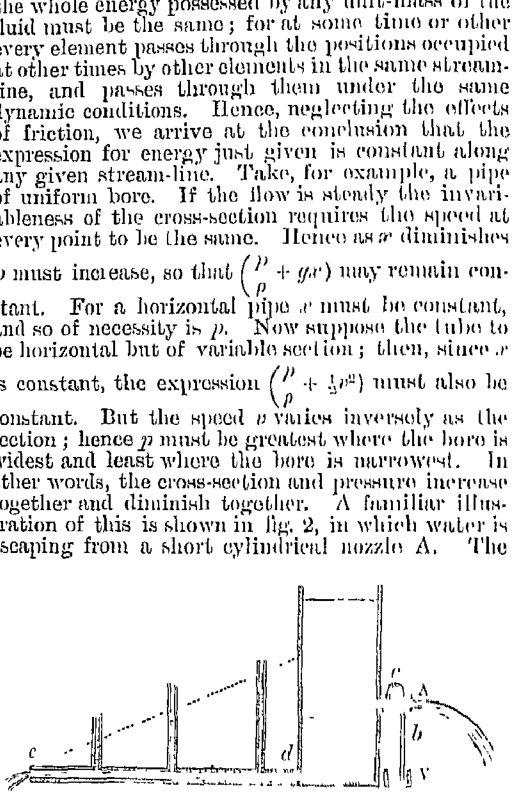


Fig. 2.

When the effects due to friction are taken into account we see in a general way that the energy, instead of remaining constant as we pass along a stream-line, will steadily fall off. In the case of a uniform pipe this loss of energy will show itself in a more rapid falling away in the pressure. For instance, in a horizontal pipe of uniform bore the pressure will steadily diminish as we pass along in the direction of the flow. At the open end of the pipe (*e*, fig. 2) the pressure is that of the atmosphere; and this will gradually increase as we pass along the pipe against the flow until we come to *d*, where the pressure falls a little short of that due to the head of water in the vessel. This may be shown experimentally as indicated in the figure, in which the small upright tubes inserted in the horizontal pipe become filled with water to a certain height. In the construction of water-works these and many other problems in hydrokinetics receive their practical solution. In the motion and flow of highly compressible fluids, such as gases, we meet with theorems similar to those just discussed for liquids. The treatment, however, is necessarily more abstruse, and is far from complete if thermodynamic considerations are left out of account. See GASES, SOUND, THERMODYNAMICS.

The hydrokinetic problems connected with the motion of solids through fluids have their most important applications in questions which concern the artilleryman and the shipbuilder. In the practice of gunnery the law of the resistance to projectiles in air has been very fully worked out. At very high speeds the resistance is very great indeed; and it may be shown that an ordinary-sized projectile if dropped from an immense height (say 40 miles) could never, under the action of gravity alone, attain a speed of 800 feet per second. One great source of loss of energy of a body moving through a liquid is the formation of eddies and vortices in its wake. These are the direct result of tangential stresses acting between contiguous portions of the fluid moving with different speeds. In virtue of the same tangential stresses the eddying motions quickly die away, and the energy, as in all such transformations, takes the form of heat.

The best English treatises on hydrodynamics are Lamb's *Motion of Fluids* (1879) and Bassett's *Hydrodynamics* (2 vols. 1888–89); see also Unwin's 'Hydraulics' in *Encyclopædia Britannica* (9th ed.).

**Hydro-extractors.** See DRYING-MACHINES.

**Hydrofluoric Acid.** See FLUORINE.

**Hydrogen** (sym. H; atom. wt. 1; Gr. *hydōr*, 'water,' and *gennāo*, 'to produce') is an elementary gas and the lightest substance known. It is colourless, odourless, and non-poisonous, although as ordinarily prepared it frequently contains traces of disagreeably smelling or of poisonous impurities. The gas when subjected to enormous pressure at an extremely low temperature can be reduced to the liquid state. In combination with oxygen it forms one-ninth part by weight of water, and it is a most important constituent of the tissues of animals and plants. It enters into the composition of a large number of manufactured substances and products used in the arts, medicine, &c., as, for instance, starch, sugar, vinegar, gutta-percha, alcohol, ether, benzene, aniline, indigo, morphia, &c. It is not found largely in nature in the free or uncombined state, but it does occur in some gaseous emanations from the earth, as in the solfataras of Iceland and in the petroleum regions of Pennsylvania. Being the lightest gas known, its density is often adopted as the standard of comparison for the densities of other gases. The density of atmospheric air compared with that of hydrogen as unity is nearly 14·5. As hydrogen possesses the lowest atomic weight of all the elements, the atomic weight of hydrogen is almost universally adopted by chemists as unity, and those of the other elements referred to it; but at present there is a decided movement in favour of the adoption as standard of an atomic weight which can be determined with more rigid accuracy than that of hydrogen can.

Although hydrogen is usually classed amongst the non-metallic elements, it is in its chemical behaviour more closely related to the metals. It combines with oxygen, at a red heat forming water, this combination being accompanied by the giving out of a great deal of heat. A jet of hydrogen burns in air or oxygen with a non-luminous flame, which is, however, sufficiently hot to heat to whiteness a fine platinum wire held in it. The behaviour of hydrogen towards chlorine is extremely interesting. The two gases can be mixed in equal volumes and preserved without combination taking place for an indefinite period if kept in the dark, but on exposure to diffused daylight combination begins, and its progress depends upon the brightness of the light and the duration of the exposure. Momentary exposure to direct sunlight causes combination to take place with explosive violence, and a similar effect is produced by raising any portion of the mixture to a red heat. Hydrogen as a rule combines with those things with which the metals in general combine, forming compounds which are analogous to those of the metals. Compounds containing hydrogen and one other element are common decomposition products of decaying vegetable and animal matters; as, for instance, marsh-gas, ammonia, and sulphuretted hydrogen, which contain hydrogen combined with carbon, nitrogen, and sulphur respectively.

Hydrogen gas, under the name of combustible air, was obtained in the 16th century by Paracelsus by treating certain metals with dilute acids, and was more or less known to Boyle and others; but Cavendish (q.v.) in his paper on 'Factitious Airs,' published in the *Transactions of the Royal Society* for 1766, was the first to describe accurately the properties of this gas, and the methods of obtaining it, hence he is usually mentioned as its discoverer.

The ordinary methods for preparing and purifying hydrogen will be found in any elementary treatise on chemistry.

**Hydrogen Peroxide** (sym. $H_2O_2$) is a compound of hydrogen and oxygen, containing a larger proportion of oxygen than water, the other compound of these elements. It was discovered in 1818 by Thénard, and was by him regarded as oxidised water as it very readily decomposes, when heated, into oxygen and water. The substance, when freed from water as completely as possible, is a thick transparent liquid, of specific gravity 1·45, without colour or smell, but possessing a bitter taste. It bleaches many vegetable colours, and when applied to the tongue or skin produces white spot and gives rise to considerable pain. bleaching action and most of its chemical acters depend upon its powerfully oxi perties. It is employed, in dilute solut restoration of oil-paintings, its action being an oxidising one.

**Hydrography,** as a branch graphy, deals with the waters of th as they are available for navigat grapher determines by means of soundings the outline of coasts an figuration of river-beds, lake-basi bottom adjacent to coasts, ascertai and extent of shoals and rocks and is as of beacons and lighthouses, investiga nature and velocity of currents, the local tid phenomena, the changes taking place in rive mouths and in harbours, and the alterations effected in coast-lines by the action of the sea. All these details it is his business to embody, as far as may be, in charts and maps which shall be serviceable for the practical mariner. See CHART.

**Hydroid.** See HYDROZOA.

**Hydromechanics,** a term sometimes used so as to cover what in this work is dealt with at Hydrodynamics (q.v.) and Hydrostatics (q.v.), as also hydraulics, or the department of engineering which deals with the application of liquids in motion to machinery. Hydromechanics is sometimes limited to the latter department alone. On the other hand, hydraulics is sometimes made to cover hydrodynamics. See ENGINEERING, with articles there cited, and WATER-WORKS, SEWAGE.

**Hydromel,** a beverage made of honey and water; fermented, it becomes mead.

**Hydrometer**, an instrument which indicates, by the depth to which it sinks in a liquid in which it floats, the specific density or specific gravity of that liquid. See Specific Density.

**Hydromys**, a genus of water-mice found in Australia, Tasmania, and New Guinea, distinguished from all other rodents by the small number ($\frac{2}{2}$) of molars. They are called Beaver-rats in Tasmania; are nocturnal and very shy; inhabit the banks of both fresh and salt water, and swim well, with the help of partially-webbed hind-feet. The largest species is twice the size of a common rat. One species has the belly white, the other yellow.

**Hydropathy**, like *Hydrotherapy* and *Hydrotherapeutics*, means the use of water in the treatment of disease, or in the prevention of the tendency to disease. Popularly, however, *hydropathy* has become so attached to a special scheme of water treatment that it will be used here in that sense alone; while *hydrotherapy* will refer to the less restricted and more scientific use of water as one of the many therapeutic weapons furnished by experience to the armoury of the practitioner of medicine. Water is the world's natural medicine. We find early mention of water as a curative agent, and its virtues are extolled by many of the classical writers—e.g. Hippocrates, Galen, Celsus, Musa, and Asclepiades. In the middle ages Aëtius, Alexander of Tralles, Paulus of Ægina, and Avicenna may be claimed as its advocates; while in more modern times Cardanus, Hoffman, Bernardo, Sir John Floyer, Dr Baynard, the Hahns, Tissot, Dr Smith, and Hancoke deserve mention; as do also Paré, Lombard, and Percy in special reference to its use in surgery. By most of these men water was applied both externally and internally—internally chiefly as a cold drink in fevers; and it was on this point the battle raged chiefly, Boerhaave and others disputing hotly against the propriety of so administering it. To Dr James Currie (q.v.), a Liverpool physician, belongs the credit of intro[illegible]g its use in fevers and febrile diseases. His was [illegible](1797) contains some most interesting informa[illegible] the records of a large number of experi[illegible] l[illegible]ed out to the best of his abilities, with [illegible]perfect thermometers then in use. His [illegible]rs to have been originally roused by [illegible] Dr Wright in treating fever, both in his [illegible] that of others, on board ship, by the [illegible] cold sea-water. Currie's work was [illegible] German by Michaelis, and spread [illegible] and wide, meeting with much [illegible] with bitter hostility. Amongst its [illegible] supporters was Oertel, a teacher in Ans[illegible] who re-edited, or rewrote, many of the older [illegible]atises, and who probably had some direct influ[illegible]ce on the man who really introduced a new era [illegible] treatment by water. This was Vincent Priessnitz (1799–1815), a Silesian farmer of Gräfenberg, who after considerable success in treating wounds and sprains in animals with cold-water bandages, had to treat himself, a horse having broken some of his ribs. Again successful, he continued the treatment whenever he could on any of the neighbouring peasants, and advanced the further step of using water internally; his fame spread, and he soon gathered an immense *clientèle* and achieved remarkable success. He showed great ingenuity in inventing, with the assistance of his patients, all sorts of new methods of applying water to every part of the body; and, though using water as his sole remedial agent, he very sagaciously employed hard exercise, fresh air, and a regulated plain diet as adjuvants. Unfortunately, being utterly ignorant of medicine, he taught peculiar ideas of disease, which he considered to be due to the presence in the blood of certain acrid humours which had to be diluted and extracted by means of water. He said the escape of these produced an eruption which marked the crisis; but as it is known that water applied continuously will produce such an eruption on even the healthiest skin, and as all the known facts of pathology are opposed to his doctrines, we are obliged to reject his theories even while his practice is admitted to be admirable. It is to this special system of water treatment that the term *Hydropathy* is now generally applied. There are, however, endless hybrid varieties in which one or other theory, or particular form of practice, is either specially rejected or adopted; so it must not be supposed that the foregoing statements apply absolutely to all hydropathists. Beyond cavil, however, the most scientific position to take up is that in which water is used as a remedial agent in every way, in which it has been proved to be useful, without restricting its use, or reading its results in the light of any theories, while at the same time care is taken to avoid all ill effects. This constitutes the system of *Hydrotherapy*, which obtains prominent notice in all modern books on therapeutics. Possibly the term might be improved, as heat in many cases seems to be the real agent, of which water is only the vehicle. Thermotherapeutics and Thermotherapy have been suggested as terms more scientifically correct. Water has often been abused, like every other good thing in this world; even an ice-water dyspepsia, due to too free indulgence in drinking iced water (but especially along with food), being not uncommon in America.

Water may be employed medicinally both internally and externally in its three forms—solid, liquid, and gaseous. For the external uses, see Bath; for its internal use with drugs in solution, see Medicine, and Mineral Springs. There is left for consideration here only its use internally as pure water. Absolutely necessary to the digestive process, it is essential to life, and requires rules for its advantageous use. Too large a quantity impairs digestion by so diluting the gastric and intestinal juices as to render them comparatively inert. The difficulty is to lay down definite rules for the right quantity, as this will vary with each individual in different surrounding circumstances, of temperature, amount of exercise, and quality and quantity of food. Personal experience and skilled advice must decide the quantity in each case.

As a general rule it is better to drink water about an hour before meals, as the gastric juice is then being prepared, and fluid will be thus supplied when most required. Every one with a weak digestion ought certainly to do this, and only drink a little *hot* water with food, as the stomach requires a considerable temperature to allow its physico-chemical reactions to be carried on successfully. Water is also very useful early in the morning and late at night as helping to flush out the stomach and bowels, dissolving and carrying off the waste materials which may have accumulated by the kidneys, lungs, and skin, the functional activity of which organs it much promotes. Where the evacuating power of the lower bowel is weak, or when piles are present, large injections of water, hot or cold as judged proper, are useful in clearing out the rectum and stimulating its coat. Ice internally or externally is very useful in checking hemorrhage and soothing irritability, as shown by vomiting or otherwise. As steam water is very useful in all forms of inflammation and irritation about the mouth, throat, or lungs, and often in such cases medication with various drugs increases its powers.

There are fifty hydropathic establishments in England, fifteen in Scotland, and only one in

Ireland. Most of these originally started with a full equipment for treatment, including a resident physician, bath attendants, and a complete set of baths; but many of the establishments now are merely high-class country boarding-houses. In a few, however, the hydropathist can still find all the usual requisites for correct hydropathic treatment. Amongst the best known of the old-fashioned houses are Smedley's at Matlock Bridge, Ben Rhydding, Ilkley Wells House, Malvern, and Southport in England; Cluny Hill near Forres, Bridge of Allan, Melrose, Rothesay, and Crieff in Scotland; and St Ann's Hill near Cork, in Ireland. Among the magnificent modern establishments we may name those at Bath, Bournemouth, Buxton, Harrogate, Ulverston, Windermere, The Hall at Bushey near Watford, Moffat, Peebles, Pitlochry, Shandon, Dunblane, Craiglockhart near Edinburgh.

See Claridge, *Cold Water Cure* (1841); Graham, *Gräfenberg* (1843); works on the Water Cure by Gully (1842-63), Johnson (1843), East (1850), Dunlop (1873), Smedley (1879), Braun (Eng. trans. 1875), and in German by Munde (1877), Runge (1879), Anjel (1886), with other works cited in the thirty pages of bibliography appended to Dr Winternitz's article on 'Hydrotherapeutics' in Von Ziemssen's *Handbook of General Therapeutics* (vol. v. 1886).

**Hydrophis.** See SEA-SNAKE.

**Hydrophobia** (Gr. *hydōr*, 'water,' and *phobos*, 'fear') is a symptom of a disease known as Rabies, which may occur in man and in various animals; but the word hydrophobia is also frequently used to denote the disease itself. It has long been known that rabies is communicated from one animal to another if the saliva of the one is introduced into the organism of the second; whether it be the case that the first has bit the second, or has only licked it on an open sore. The saliva of a rabid animal produces no injurious effect if brought in contact with the unbroken skin of an animal, or even with a mucous surface, provided it be not excoriated. The dog is the animal most frequently affected by rabies.

When a rabid dog bites another animal the latter shows no immediate symptoms of disease. The wound caused by the teeth of the dog behaves like an ordinary wound and becomes cicatrised in the same manner. After the lapse of a certain period, which may vary from nine or ten days to several months (cases are known where the time has been as long as twenty-six or twenty-eight months), but is generally from four to six weeks, the animal that was bitten exhibits special symptoms; rabies has declared itself. The time that has lapsed since the bite was received is called the period of incubation. When the affected animal is a man, the first symptom is usually a change of character; he becomes melancholy and distrustful. Next, generally at the beginning of the case, appears a symptom called *aërophobia*—the smallest breath of wind which touches the skin of the face causes its muscles to contract. Next comes hydrophobia—if the sufferer is offered anything to drink, his throat contracts, and he suffers spasms of the pharynx. When this symptom appears the death of the sufferer is at hand, and is certain to occur in two or three days. During the interval between the appearance of the hydrophobic symptoms and death the patient has periods of calm and accesses of fury, and also exhibits paralytic symptoms which usually commence in the lower limbs.

Rabies is therefore communicated by biting from one animal to another; any scratch made by the teeth of the affected animal is harmless unless the saliva is conveyed to the wound. The animals liable to be affected by rabies are very numerous, and comprise almost all the mammalia—men, dogs, cats, horses, cattle, sheep, wolves, foxes, deer, &c.

The question of the etiology of rabies has remained very obscure until a very recent date; the most contradictory opinions were current when M. Pasteur in 1880 set himself to study this malady. His labours justify the following statements.

Rabies is a virulent disease, transmissible from one animal to another by the inoculation into the latter of those various secretions and tissues of the affected animal in which the virus dwells. This virus consists of a living organism which has not yet been made visible, by reason of the insufficiency of microscopic apparatus, but its existence can nevertheless not be denied. This statement, taken in connection with the results of M. Pasteur's labours in regard to the impossibility of Spontaneous Generation (q.v.), utterly contradicts the assertions of those who pretend to have observed rabies in animals which have never come into contact with rabid animals. Such assertions are always based on incomplete observations. If rabies could arise spontaneously in dogs, how can we explain the fact that vast regions like Australia may be wholly exempt from this scourge in spite of the great number of dogs there? The reason is that in these countries they most energetically prevent the introduction of any dog that can be suspected of rabies. If there were conditions under which rabies might spontaneously appear in dogs, then in territories so vast as the Australian colonies these conditions would certainly be realised from time to time. But there is no rabies in Australia.

M. Pasteur has studied the distribution of the virus in the individuals affected. He has observed that the virus was found in the nervous system and in the saliva, but not in the blood, the lymph, &c. Hence, if we inoculate another animal with the blood of a rabid beast, the first will remain wholly free of any rabid infection. Similarly, rabid virus introduced directly into the circulatory system of an animal will not produce rabies. But there is a sure means of communicating rabies from one animal to another—viz. by the introduction under the [illegible] mater, on the surface of the brain, of a liquid [illegible] has first been sterilised and in which thereaf[illegible] has been soaked a portion of the cent[illegible] system of the rabid animal. By this o[illegible] is absolutely certain to communicate [illegible] the animal is refractory to rabies an[illegible] the disease. In the course of hi[illegible] Pasteur observed that, in certain gro[illegible] which had been inoculated beneath [illegible] large quantities of rabic virus, some[illegible] not take rabies, but became incapab[illegible] it—i.e. they might with impunity be i[illegible] on the surface of the brain with rabic virus. [illegible] observation was the origin of the discovery [illegible] preventive inoculation — of inoculation which renders an animal refractory to rabies.

The principle of such inoculation is as follows: The spinal cord of a rabbit which has died of rabies, when extracted from the body of the creature, and preserved in dry air at a constant temperature of 23° to 24° C. (74° to 76° F.), loses by slow degrees its virulence. With a spinal cord which has been so preserved for fourteen days it is impossible to communicate rabies to a rabbit or a dog. But this spinal cord has nevertheless still a certain power to confer immunity from the disease—the inoculation of an animal with a sufficient quantity of it will render it refractory to rabies. At the same time M. Pasteur observed that the freshest spinal marrows, that is to say, the most virulent, are those best fitted to confer immunity from infection. To render an animal refractory to infection the treatment commences by inoculating it with spinal cord fourteen days old, then with that of thirteen days, and so on till spinal matter three days old is reached, two days, one day, and even such as is not yet one day old. The last may be introduced into the subject of experiment without danger, because it is already *refractory*.

What gives this discovery an enormous value is that these preventive inoculations made on an animal early enough and swiftly enough *after* it has been bitten prevent rabies from declaring itself. This is explicable on the following grounds: The virus is deposited by the dog's bite in a superficial wound: there it meets with little nerve-filaments in which it is further cultivated, and by means of which it ascends, somewhat slowly, to the nervous centres. These nerve-centres are the quicker affected the nearer to them the bite has been inflicted: hence bites on the head produce rabies after a shorter period of incubation than bites on the extremities of the body. If there is time to render the organism refractory by means of the preventive inoculations before the nerve-centres are affected the victim is saved; the nerve-centres once affected and destroyed, it is evident that no power of man can bring about a cure.

What ought to be done when any one is bitten by a mad dog is this. The wound made by the dog's teeth should be cauterised as soon as possible, and deeply too, so that if possible the virus may be destroyed before it has begun to cultivate itself in the nervous system. Then, if it is certain that the animal which inflicted the bite is mad, or if there is good reason so to believe, the victim should be sent as speedily as practicable to the nearest 'Anti-rabic Institute.' It is obvious that his safety depends on the quickness with which this is done. It is also obvious that bites on the head are more serious than bites on the limbs, inasmuch as there is a shorter distance to be traversed ere the nerve-centres are reached.

How can one make sure that the biting dog is mad? If possible the dog should be kept under observation without being killed; for it is much easier to recognise rabies in a living animal than [illegible] the earliest post-mortem examination. The [illegible] will change its character, will often cease [illegible] will bite everything within its reach, and [illegible] times show signs of paralysis, its hind-[illegible] its lower jaw being first attacked. [illegible] the animal will inevitably die in from [illegible] days, or at most in eight days. A [illegible] examination will show the stomach [illegible], and containing on the contrary [illegible] such as bits of wood, stones, [illegible] the most certain way of discovering if [illegible] mad is to introduce by way of [illegible] a portion of its medulla under the dura [illegible] a rabbit. The rabbit will inevitably become rabid if the dog was rabid, but this will not take place till after fifteen or eighteen days; so that it would be imprudent for a person who had been bitten to await the result of the experiment before beginning to undergo preventive inoculation.

Statistics of the proportion of deaths by hydrophobia had never been properly kept up to the time of M. Pasteur's work in this department. Few doctors actually knew this terrible malady. It is generally said that of a hundred persons bitten by mad dogs some nineteen or twenty die of hydrophobia. This figure is probably too low. The mortality amongst cases treated at the Pasteur Institute (established by him in Paris in 1886) has fallen to less than ½ per cent.

[So far M. Pasteur has sketched his discoveries and practice in regard to rabies, but a brief unargumentative review of current adverse criticism is also requisite. (1) As a working hypothesis, Pasteur assumes the occurrence of a specific microbe of rabies, which (in spite of various sanguine investigators) has not yet been demonstrated. In default of this demonstration, it seems to many that both the practice and the theory of rabic inoculation lack security and conclusiveness. (2) Again, there are some who, while believing vaccination to be empirically justified, are dissatisfied with the warrant for the anti-rabic treatment. They urge the acknowledged divergence between the two methods, and criticise the principle on which Pasteur works. (3) As to the warrant furnished by Pasteur's results, it is argued that the statistics are unreliable—e.g. because many of the patients inoculated were probably never infected, because in genuine cases the prevention may have been due to preliminary cauterising and to factors apart from the anti-rabic inoculation, and for various other reasons which forcibly suggest that in drawing inferences from statistics the sources of error are indeed numerous. (4) Less useful criticism is that which emphasises what is often true of progressive medical investigation—namely, that there have been failures in Pasteur's treatment, that certain tentative measures were confessedly futile, that there have been striking changes of method, and so on. (5) More serious is the allegation that some deaths have occurred as the result of the inoculations rather than of the infection from the rabid animal. Of such not altogether unprecedented casualties the possibility, but not the actual occurrence, was admitted by the English Investigation Committee (1887), while Dr Armand Ruffer, who speaks with much authority, denies (1889) with all deliberateness that there is any case on record in which it can be proved that death has followed as the result of Pasteur's treatment. (6) The anti-vivisectionists have urged against certain implications of Pasteur's procedure various considerations which merit careful discussion, though without special bearing on the present problem. (7) So, too, the thorough-going anti-vaccinationists are of course among the critics of Pasteur, but their arguments can best be dealt with in connection with vaccine inoculation, about which we know at least a little more than we do in regard to the anti-rabic preventive (see VACCINATION). (8) Though there is much to be said on both sides, those who are willing to leave the problem to the experts will believe meantime that Sir James Paget, T. Lauder Brunton, George Fleming, Sir Joseph Lister, Richard Quain, Sir Henry E. Roscoe, J. Burdon Sanderson, and Victor Horsley had good reasons for saying in the Report which they presented to parliament in 1887: 'It may, hence, be deemed certain that M. Pasteur has discovered a method of protection from rabies comparable with that which vaccination affords against infection from smallpox.'

In 1889 a Mansion House Fund was raised in London to enable poor English sufferers to be taken to the Institute; but like every other recognition of Pasteur's method, the scheme was reviewed with keen hostility by anti-vivisectionists and anti-vaccinators. In 1890 Dr Paul Gibier, a pupil and assistant of M. Pasteur, opened a Pasteur Institute in New York.

See Report of a Committee on M. Pasteur's Treatment of Hydrophobia, presented to parliament, 1887. For good summaries of Pasteur's method, see Dr E. Roux, Croonian Lecture, *Proc. Roy. Soc.* xlvi. (May 1889); Dr A. Ruffer, *Brit. Med. Jour.* (September 1889); Vignal, *Brit. Med. Jour.* (April, May, 1886). See also papers by Pasteur in *Comptes Rendus Acad. Paris*, in *Bulletin de l'Acad. de Méd.* (from 1881 onwards), in the *Annales de l'Institut Pasteur*, and in the *New Review* (November 1889). See also *Louis Pasteur, his Life and Labours*, by his son-in-law (trans. by Lady Claud Hamilton, Lond. 1885). Of works published before Pasteur's discoveries, it must suffice to mention that of Fleming. For criticisms of Pasteur, reference may be made to publications of the Anti-Vivisection societies (especially Victoria Street, London), to papers by Dr A. Lutaud in the *Jour. de Médecine de Paris;* Dr T. M. Dolan, *M. Pasteur and his Methods: a Critical Analysis* (Lond. 1886); Dr C. W. Dulles, *Medical Record* (New York, 1886); Dr M. Biggs, *The Medical News* (Philadelphia, 1886)].

**Hydrophyllaceæ,** a natural order of herbs and bushes, containing about eighty known species, natives chiefly of the colder parts of America. None of them are of importance; but some of them are favourite ornaments of flower-borders, particularly different species of Nemophila.

**Hydrostatics** treats of the equilibrium of liquids, and of their pressures on the walls of vessels containing them. It is a purely dynamic science, and concerns itself virtually with only two of the many physical properties of liquids. These are density and mobility. In virtue of the latter property, a liquid has no tendency to conserve its shape, so that if a distorting force acts on it it yields without any tendency to recover. It has no Elasticity (q.v.) of form. Viscosity (q.v.) may retard the rate at which the distorting force takes effect; but a liquid will continue to change form so long as there is a force acting on it which is not balanced by a perfect reaction. Thus, in hydrostatic problems, nothing of the nature of a distorting force is taken into consideration. All pressures acting on portions of the liquid must therefore be perpendicular to the surfaces on which they act; and equilibrium requires equality of pressure in all directions at any point.

The fundamental property may be thus stated: When a pressure is exerted on any part of the boundary of a liquid at rest, that pressure is transmitted undiminished to all parts of the mass and in all directions. Most of the other propositions of hydrostatics are only different forms or direct consequences of this truth, which may be proved experimentally. Suppose a close box B to be filled with water, and to have inserted into the upper cover a tube *a*, with closely-fitting plug or piston, 1 square inch in area. If the piston *a* is now pressed down upon the water with a force equal to a pound weight, the water, being unable to escape, will react upon the piston with the same force; but it obviously will not press more against *a* than against any other part of the box, therefore every square inch of the interior surface of the box is pressed outward with the force of a pound. If, then, there is another tube inserted in any part of the box with a plug of the same area, as at *b*, it will require a force of a pound to keep this plug in its place. (We leave out of account at present the pressure upon *b* arising from the *weight* of the water in the box above it—i.e. we neglect gravity and consider only the pressure propagated by the forcing down of the plug *a*.) However many plugs of the same size there may be, each will be pressed out with the same force of a pound; and if there be a large plug of four times the area, as at *c*, it will be pressed out with a force of four pounds. We have only, then, to enlarge the area of the piston *c* to obtain any multiplication of the force exerted at *a*. If the area of *c* is 1000 square inches, that of *a* being 1 square inch, a pressure of one pound on *a* becomes a pressure of 1000 pounds on *c*; and if we make the pressure on *a* one ton, that on *c* will be 1000 tons. This seemingly wonderful multiplication of power has received the name of the *hydrostatic paradox*. It is, however, nothing more than what takes place in the lever, when one pound on the long arm is made to balance 100 pounds on the short arm.

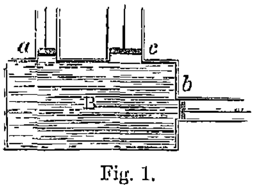


Fig. 1.

If the pressure supposed to be exerted on the piston *a* arise from a pound of water poured into the tube above it, it will continue the same though the piston be removed. The pound of water in the tube is then pressing with its whole weight on every square inch of the inner surface of the box—downwards, sidewise, and upwards. The apparatus called the *hydrostatic bellows* acts on this principle (see fig. 2). It consists of two stout circular boards connected together by leather in the manner of a bellows, B. The tube A is connected with the interior; and a person standing on the upper board, and pouring water into the tube, may lift himself up. If the area of the upper board is 1000 times that of the tube, an ounce of water in the tube will support 1000 ounces at W. It is on the same principle that the Hydraulic Press (q.v.) depends.

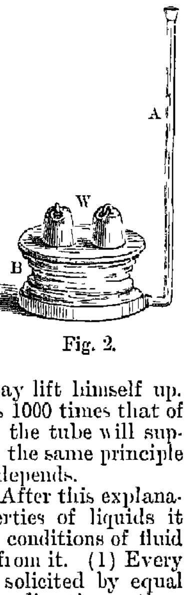
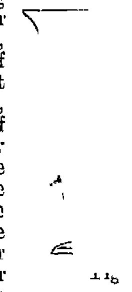


Fig. 2.

(1) *Equilibrium of Liquids.*—After this explanation of the fundamental properties of liquids it may be enough to state the two conditions of fluid equilibrium which directly flow from it. (1) Every particle of the liquid must be solicited by equal and contrary pressures in every direction; otherwise there would be a tendency to motion, and therefore motion because of the liquid property of mobility. (2) The upper particles at the free liquid surface must form a surface perpendicular to the impressed force. The truth of this is experimentally demonstrated by the horizontali of the surface of a liquid at rest under grav It can be shown to be a consequence of primary property of 'pressing equally in all directions,' for let *da* and *cb* be vertical lines, or lines in the direction of gravity; and *ab* a plane at right angles to that direction, or horizontal. A particle of the liquid at *a* is pressed by the column of particles above it from *a* to *d*; and the like is the case at *b*. Now, since the liquid is at rest, these pressures must be equal; for if the pressure at *b*, for instance, were greater than at *a*, there would be a flow of the water from [illegible] towards *b*. It follows that the line *ad* is equal to *bc*, and hence that *dc* is parallel to *ab*, and therefore horizontal. The same might be proved of any two points in the surface; therefore the whole is in the same horizontal plane.



(2) *Pressure of Liquids on Surfaces.*—The general proposition on this point may be stated thus: The pressure of a liquid on any surface immersed in it is equal to the weight of a column of the liquid whose base is the surface pressed, and whose height is the perpendicular depth of the centre of gravity of the surface below the surface of the liquid (see CENTRE OF PRESSURE). The pressure thus exerted is independent of the shape or size of the vessel or cavity containing the liquid.

(3) *Buoyancy and Flotation.*—As a consequence of the proposition regarding the pressure of liquids on surfaces it can be shown that when a solid body is immersed in a liquid its loss of weight is equal

to the weight of the displaced liquid—i.e. to the weight of an equal bulk of liquid. Thus, if a cubic foot of the liquid weighs the same as a cubic foot of the solid, the solid will appear to have lost all its weight, and will remain in the liquid wherever it is put; if a cubic foot of the liquid weighs less than a cubic foot of the solid, the solid will appear to lose part of its weight, and will sink; but if a cubic foot of the liquid weighs more than a cubic foot of the solid, the immersed solid will not only lose all its weight, but will appear to be dominated by a *negative* weight, being urged upwards to the surface of the liquid by a force equal to the difference of the weights of the displaced liquid and the solid. In this last case the solid will rise until it swims or floats on the surface of the liquid, the amount of solid immersed in this final state of equilibrium being determined by the obvious principle that a floating body must be buoyed up by a force equal to its own weight. Here again, then, the solid seems to lose all its weight, which loss must be simply the weight of the displaced water. Thus in fig. 4, where AB represents a floating solid, the water displaced by the immersed part B is equal in weight to the whole solid.

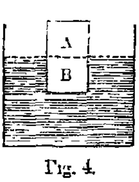


Fig. 4.

As the buoyancy of a body thus depends on the relation between its weight and the weight of an equal bulk of the liquid, the same body will be more or less buoyant, according to the density of the liquid in which it is immersed. A piece of wood that sinks a foot in water may sink barely an inch in mercury. Mercury buoys up even lead. Also a body which would sink of itself is buoyed up by attaching to it a lighter body; the bulk is thus increased without proportionally increasing the weight. This is the principle of life-preservers of all kinds. The heaviest substances may be made to float by shaping them so as to make them ace a volume of water greater than the bulk eir own solid substance immersed. A flat of iron sinks; the same plate, made concave cup or boat, floats. It may be noted that property of liquids is independent of expanse, if there be only enough to ject. A few pounds of water might r up a body of a ton weight; a ship a small dock as in the ocean.

*f Floating Bodies.*—Conceive *abd* portion of a liquid turned solid,

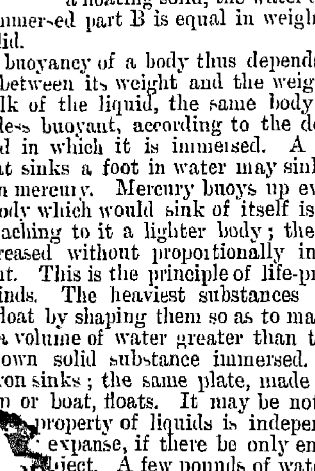


Fig 5.

but unchanged in bulk; it will evidently remain at rest, as if it were still liquid. Its weight may be represented by the force *cg*, acting through its centre of gravity *c*; but that force is balanced by the upward pressure of the water on the different parts of the under surface; therefore, the resultant of all these elementary pressures must be a force, *cs*, exactly equal and opposite to *cg*, and acting through the same point *c*, otherwise the body would not be at rest. Now, whatever other body of the same size and shape we suppose substituted for the mass of solid water *abd*, the supporting pressure or buoyancy of the water around it must be the same; hence we conclude that when a body is immersed in a liquid the buoyant pressure is a force equal to the weight of the liquid displaced, and acting in the vertical line through the centre of gravity of the space from which the liquid is displaced. This point may be called the *centre of buoyancy.*

We may suppose that the space *abd* is occupied by the immersed part of a floating body *acbd* (fig. 5). The supporting force, *cb*, is still the same as in the former case, and acts through *c*, the centre of gravity of the displaced water; the weight of the body must also be the same; but its point of application is now *c′*, the centre of gravity of the whole body. When the body is floating at rest or in a state of equilibrium, this point must evidently be in the same vertical line with *c*; for if the two forces were in the position of *cs*, *c′g* (fig. 6), they would tend to make the body roll over. The line passing through the centre of gravity of a floating body and the centre of gravity of the displaced water is called the *axis of flotation.*

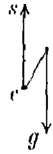


Fig. 6.

A floating body is said to be in *stable* equilibrium when, on suffering a slight displacement, it tends to regain its original position. The conditions of stability will be understood from the accompanying figures. Fig. 7 represents a body floating in equilibrium, G being its centre of gravity, B its centre of buoyancy, and AGB the axis of flotation, which is of course vertical. In fig. 8 the same body is represented as pushed or drawn slightly from the perpendicular. The shape of the immersed portion being now altered, the centre of buoyancy is no longer in the axis of figure, but to one side, as at B. Now, it is evident, that if the line of direction of the upward pressure—i.e. a vertical line through B—meets the axis above the centre of gravity, as at M, the tendency of the two forces is to bring the axis into its original position, and in that case the equilibrium of the body is stable. But if BM meet the axis below G, the tendency is to bring the axis further and further from the vertical, until the body get into some new position of equilibrium. There is still another case; the line of support or buoyancy may meet the axis in G, and then the two forces counteract one another, and the body remains in any position in which it is put; the body is then said to be in *neutral* equilibrium. In a floating cylinder of wood, for instance, B is always right under G, in whatever way the cylinder is turned. When the angles through which a floating body is made to roll are small the point M is nearly constant. It is called the *metacentre;* and its position may be calculated for a body of given weight and dimensions. In the construction and lading of ships it is an object to have the centre of gravity as low as possible, in order that it may be always below the metacentre. With this view, heavy materials, in the shape of ballast, are placed

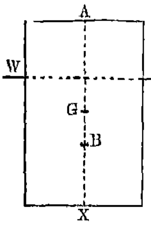


Fig. 7.

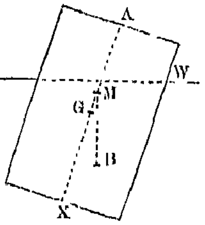


Fig. 8.

in the bottom, and the heaviest portions of the cargo are stowed low in the hold. See SPECIFIC GRAVITY.

**Hydrosulphuric Acid.** See SULPHUR.

**Hydrothorax** (derived from *hydōr*, 'water,' and *thorax*, 'the chest') is the term applied to dropsical collections in the pleura. See DROPSY, PLEURISY.

**Hydrozoa,** one of the main divisions of the phylum or sub-kingdom Cœlenterata (q.v.), the other two being Ctenophora (q.v.) and Anthozoa or Actinozoa (q.v.). Two animal forms (zooids), reducible to one common plan, are present, which often alternate in the life-history of the individual. Of one of these, the Hydroid or Polyp, the common fresh-water Hydra (q.v.), may be taken as the simplified type; the other is the Medusa or jellyfish. It is only in this latter or in some degenerate form of it that sexual organs are produced (except in the case of Hydra). The Hydrozoa may be free or fixed, simple or colonial, and these variations in habit, along with the existence of two kinds of zooids just referred to, render their constitution so complex that it will be advantageous to describe briefly one or two typical forms before giving the systematic arrangement of the group.

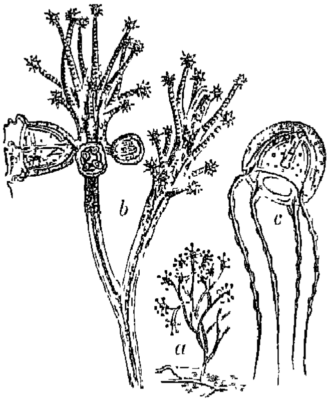


Fig. 1.

*a*, *Syncoryne frutescens* (reduced); *b*, branch of same (magnified); *c*, *Sarsia*, Medusa of same, shortly after liberation. (After Allman.)

In the case of Sarsia the egg produced by the jellyfish develops first into an ovoid ciliated cellular larva (*planula*), which attaches itself to some solid object by one end, whilst the other grows into a polyp with mouth and tentacles, a colony being afterwards produced by budding. In the most essential points of its structure the Hydra may be regarded as the type of these polyps; the tentacles, however, are solid, and arranged in more than one circle; they have club-shaped ends beset with thread-cells. The name Syncoryne has been given to the polyps of this genus. Upon the walls of the expanded extremities appear buds, each of which, gradually enlarging and assuming the structure of a Medusa, drops off when ripe and leads an independent existence. It consists of a high bell, the mouth of which is partly closed by a circular veil attached round its margin. The clapper of the bell (*manubrium*) is long, cylindrical, and contractile, and has a mouth at its extremity leading into a stomach within its base, from which four canals radiate within the substance of the bell. At the margin of the bell they are united by a ring-canal, and beyond this they are produced into long hollow contractile tentacles. Near the origin of these from the ring-canal are situated eyes, which are not merely sensitive to light, but capable of vision. A double nerve-cord passes along the ring-canal, and sexual organs are developed in the wall of the manubrium. The inner and outer surfaces of the bell are covered with ectoderm, whilst the cavity of the stomach and the canals leading from it are lined with ciliated endoderm. There are ectodermal muscles in the sub-umbrella. The eggs produced by the process of sexual reproduction develop into polyps and the whole life-circle is repeated.

In certain cases the Medusa or sexual person, instead of becoming free, has remained attached to the Hydroid polyp, and under such circumstances has undergone more or less degeneration. It may (1) present the principal structural features of a Medusa, except that it is mouthless, and that it has the form of a closed sac owing to the adhesion of the margins of the bell ('adelocodonic gonophore' of Allman), or (2) it may be merely a bud containing sexual products ('sporosac').

*Aurelia aurita*, one of the commonest jelly-fishes of our coasts, may be selected as an example of a Medusa of quite different structure. The bell is flattened, thickest in the centre, and notched round the margin. The manubrium is split up into four long pointed processes with fringed margins, and from the stomach and from its four saccular expansions there proceed eight unbranched canals, and eight which bifurcate several times, and are united by a marginal ring-canal. Four ring- or ear-shaped reproductive glands are developed in the base of the stomach, but hang down on the lower surface of the bell. In each of the eight marginal notches, which correspond to the main stems of the branched canals, is a so-called 'marginal corpuscle,' or sense-organ, containing an otolith and a pigment mass. These sense-organs appear to be nerve-centres, and, by their connection with a nervous plexus in the sub-umbrella, to control the movements of the animal: there is no closed nerve-ring. Between the marginal corpuscles are a large number of short tentacles. The egg gives rise to a ciliated planula, which, after swimming freely for some time, becomes fixed and gives rise to a polyp (Scyphistoma) which has at first four, then eight,

Fig. 2.—Aurelia aurita (

and then many tentacles. Four
reaching from the base to the marg
divide the cavity of the polyp into
and four lateral recesses. Usually
undergoes a series of transverse cons
which produce a series of Medusæ, which are
free after the tentacles of the polyp have been absorbed. The organism in this stage is known as a Strobila. After a whole series of Medusæ has been thus set free the polyp can form tentacles afresh, and the whole process can be repeated. The Medusæ when first set free have neither arms, marginal tentacles, radial canals, nor reproductive organs, so that they have to undergo a complicated development in the free state.

The Hydrozoa are widely distributed, and all marine, with few exceptions (e.g. Hydra, Cordylophora). The Hydroid polyps and colonies are attached to foreign substances, the Medusæ and Siphonophora are free-swimming, in most cases near the surface, though certain forms appear to be denizens of deep water (Pectis, Nauphanta, Rhodalia). They are carnivorous, and some are beautifully phosphorescent (Pelagia, Diphyes). A few are fossil—e.g. the palæozoic Graptolitidæ and

Stromatoporidæ, and some Medusæ from the Jurassic period, and some from the Chalk. There are about 1000 species, arranged under some 350 genera, which may be classified as follows :

I. CRASPEDOTA (Hydromedusæ)—Hydroid form, either free and temporary, or free or fixed, simple or colonial, and permanent. Sometimes tentaculate, tentacles usually solid ; mouth prominent, gastric cavity simple, skeleton usually chitinoid, rarely calcareous. Asexual reproduction, usually by gemmation. Medusoid form, with tubular manubrium, and an inturned velum ; sensory organs, ocelli, or auditory organs. It may become sessile and degenerate. Sexes separate. Almost all marine.

(i) *Trachymedusæ* (Monopsea, Haplomorpha)—Free-swimming Medusæ, with the gelatinous substance of the disc hard and stiff ; no hydriform phase in development ; tentacles primitively solid ; auditory vesicles present. Examples : Geryonia, Ægina.

(ii) *Hydroidea*—Hydriform person, with small polyps; generally colonial, with a chitinous (rarely calcareous) exoskeleton. Sexual only in Hydra. Medusiform person produced by gemmation from the hydriform, often degenerate. (1) Tubularia (Gymnoblastea, Anthomedusæ), hydriform person usually colonial ; no special receptacles for the polyps (thecæ), or the fusiform buds (*gonangia*) ; sexual organs in the outer or oral wall of the stomach. Medusæ have neither otocysts nor tentaculocysts, but ocelli at the bases of the tentacles ; and are of the kind known as Anthomedusæ. Examples : Tubularia, Coryne, Cordylophora. (2) Campanulariæ (Calyptoblastea, Leptomedusæ), hydriform person in permanent colonies, with a single circle of solid tentacles; hydrothecæ and gonangia usually present; medusiform persons belong to the division Leptomedusæ, being flattened, having the velum feebly developed ; tentacles 2, 4, 6, 8, up to several hundred, sometimes with ocelli at the base ; auditory organs sometimes present ; sexual glands in the radial canals. Examples : Campanularia, Sertularia, Plumularia. (3) Eleutheroblastea, colonies not permanent; no differentiated gonophores. Examples: Hydra, Protohydra. (4) Hydrocorallia, skeleton calcareous, containing the Stylasteridæ and the Millepores (q.v.). (5) Rhabdophora, containing certain Cambrian and Silurian fossils known as Graptolites (q.v.).

(iii) *Syphonophora*.—Pelagic colonies, with several different kinds of modified polyps or Medusæ (see special article).

II. ACRASPEDA (Acalephæ, Scyphomedusæ).—Medusæ, generally of considerable size, with lobed margin, bearing sensory spherules ; manubrium square, usually produced into prolonged angular lappets ; no velum ; the sexes are separate ; nervous centres in the marginal sensory bodies. Hydroid form known in but few instances ; small and fixed, mouth surrounded by a disc, provided with sixteen or more solid tentacles ; multiplies by lateral buds on a creeping shoot ; Medusæ formed from it by transverse fission. All marine.

(i) *Tesseroniæ*.—Umbrella high, parts disposed in fours, four [illegible] pouches. (1) Stauromedusæ, without sensory bodies. [illegible]: Lucernaria. (2) Peromedusæ, with four sensory [illegible] disposed between the principal radii. (3) Cubomedusæ, [illegible] four sensory organs, placed in the principal radii, four [illegible]cles, and eight marginal pouches. Example: [illegible]

[illegible] (Discomedusæ).—Umbrella flattened, parts [illegible]s. (1) Rhizostomæ, no central mouth, [illegible] apertures on eight long root-like arms ; no [illegible]le : Crambessa. (2) Semostomæ, four long [illegible] a *simple cruciform* mouth. Example : [illegible]tomæ, no arms round the mouth, which [illegible] lid, usually short. Example : Nausithoe.

[illegible] text-books of Zoology in general, the [illegible] may be consulted : Forbes, *Monograph* [illegible] *[illegible]aked-eyed Medusæ* (Ray Society, Lond. [illegible] [illegible]ssiz, *North American Acalephæ* (Camb. [illegible]865); Hincks, *British Hydroid Zoophytes* (1868); [illegible]an, *Monograph of Gymnoblastic Hydroids* (Ray [illegible]ety, 1872); *Report on the Hydroida* (*Challenger* Reports, *Zoology*, parts 20 and 70, 1883 and 1888); Claus, *Untersuchungen über die Organisation und Entwickelung der Medusen* (1883); Haeckel, *System der Medusen* (1879-81); *Deep-sea Medusæ* (*Challenger* Reports, *Zoology*, part 12, 1882); Lendenfeld, *The Australian Hydromedusæ* (1885) and other papers.

**Hyères,** a town of Provence, in the French department of Var, on a southern hill-slope, crowned by a ruined castle, 3 miles from the Mediterranean, and 13 E. of Toulon by rail. Embosomed in palm-groves and orange-orchards, it is celebrated for the beauty of its situation and its mild, dry climate, and is therefore growing more and more in favour as an invalid resort between October and May. An English church was built in 1884 ; and since 1875 great improvements have been carried out in the way of drainage, waterworks, boulevards, &c. Massillon was a native. Pop. (1872) 5881 ; (1886) 8046. Near the coast lie the wooded Îles d'Hyères or d'Or (anc. *Stœchades*). Here the heat of the climate is tempered by the sea-breezes, and the season seems an eternal spring. See Denis, *Hyères, ancien et moderne* (4th ed. Hyères, 1882).

**Hyctography.** See RAIN.

**Hygieia,** in classical mythology the goddess of Health, was the daughter of Æsculapius. She was worshipped at Athens, Corinth, Argos, and other important cities, and in works of art is usually represented as a virgin, with a snake, the symbol of health, which drinks from a cup held in her hand.

**Hygiene** is the name given to that department of inquiry which deals with the causes and prevention of disease in their relation to the preservation of health. As thus defined, hygiene, while it is founded on medical experience, and while it is advanced by medical research, stands out clear and defined from the ordinary run of the science and art of medicine which deal with the cure of disease. The aim of hygiene is to prevent disease by the due appreciation of the causes which induce a departure from the normal type of healthy life. In this sense it has well been named Preventive Medicine, since it seeks to anticipate the work of the physician by its endeavour to remove the causes on which the diseases that affect mankind depend. Hygiene presents for consideration two chief phases. The first section of *Personal Hygiene* relates to the individual as a unit and to his duties in the maintenance of health, and in disease prevention. The second section deals with *Public Health*, and concerns the relations which exist between masses of men and the conditions of healthy living. In the first case the study embraces such subjects as food, clothing, habits, heredity, and the like, which relate to the personal history of the unit. In the latter case hygiene has to regard the community and the nation, and to investigate the laws under which disease is liable to be propagated by the circumstances of collective life. The departments of hygiene which deal with drainage, healthy houses, the removal of waste, and the prevention of infectious disease illustrate the subjects with which the public sanitarian or health officer concerns himself. It is of importance, however, to note that, as regards these two aspects of hygiene, their scope is by no means so restricted and so limited as the terms of their definition might seem to imply. For public health, as may readily be shown, can only be advanced by the endeavours of individuals. It is the individual and personal culture of health which not only must precede, but which also forms the foundation of public sanitation.

The history of hygiene forms in itself a study of much interest, and teaches us that, like most other branches of modern science, that of health has exhibited a gradual evolution and a cumulative advance. Very far back in the history of mankind we may trace the presence of the ruling idea of hygiene, that disease could be prevented by attention to the laws and conditions of healthy living. That the hygienic codes of the Jews were remarkably full and complete is evident from a perusal of the Mosaic books of the Scriptures. These laws, dealing with questions of food and feeding, with the isolation of the sick, and with the removal from camps and dwelling-places of waste matters, were of singularly enlightened character. The modern Jews have profited by the attention paid by their forefathers to questions of sanitation in the shape of their greater relative longevity, and their freedom from the scourges and plagues that have decimated the nations amidst which they dwell. The great desire of the ancient Jew that his days might be long in the land, and that his race should grow strong and multiply exceedingly, bore a very evident relation to the practice of those health laws according to which immunity from disease is secured and longevity encouraged. So that early enough in the phases of human development and civilisation sanitary science began to be studied in view of its obvious effects upon both personal and national welfare. The Greeks may also be quoted as a nation given to make a special study of the conditions of healthy living; but in their case the culture of a high standard of physique probably included most, if not all, the points to which this ancient people paid attention. They entertained a lofty ideal of physical beauty, and attained this ideal undoubtedly through the practice of much that partook of the character of hygienic science. Apart from this bodily culture, however, the Greek was not a sanitarian in the true sense of the term. He was visited by epidemics and plagues, which were regarded as signs of displeasure on the part of his deities. He made no attempt to discover the causes of these scourges or to arrest their course. Sanitation in Greece of old was therefore more a thing of chance than of scientific nature; and of ancient Rome the same opinion may be expressed. Great public works, and most notably those connected with water-supply and drainage, were certainly undertaken and carried out on a scale of magnificence; and so far these measures must have aided in the maintenance of the public health; but plagues were frequent and loss of life excessive as in ancient Greece, and of the laws of health as we to-day understand that term the classic nations seem to have been nearly ignorant. Medicine itself was of course in its infancy; and for this reason—viz. the lack of knowledge of the causes of disease—the health of the ancients was largely a matter of chance.

The record of progress in health science naturally follows the course and track of ordinary history, and in this respect forms a most interesting comment on the social advance of the people. The middle ages with ourselves, for example, beheld personal health neglected and public health unknown. Cleanliness was conspicuous by its absence; the 'sanctity of dirt' was respected by priest and people alike; the houses were built closely together; their domestic appliances were of the rudest description; and drainage was nonexistent. The conditions of ordinary existence were those of rapine and war, and under such circumstances it is not wonderful that the science which devotes itself to saving life should scarcely have made its influence felt at all. The clearest proofs of the utter neglect of sanitation were to be found in the fevers and plagues with the records of whose frightful mortality the story of the middle ages teems. Dr Guy, who made a special study of the history of the epidemics of the middle ages, tells us that in the 12th century no fewer than fifteen epidemics and many famines were recorded. The 13th century saw twenty plagues and nineteen famines; while the 14th beheld in its early part eight epidemics and a succession of famines. In 1348 came to England the Black Death or Great Pestilence. As the result of this plague, which attacked Europe from the East, 100,000 persons died in London alone. In Europe at large it was estimated some 25 millions of persons died from this plague. The Sweating Sickness attacked England in 1485. This was a plague which was apparently propagated within the bounds of our own land by the filthy and impure surroundings of the people. After being attacked by the sweating sickness, the victim usually died within twenty-four hours. It attacked the well-to-do and intemperate livers especially, and appears to have been more fatal in the case of men than of women. After a succession of reappearances this epidemic passed away in 1551, and has since that date been extinct. A century or so later (in 1666) came the Great Fire of London, a catastrophe which was not an unmixed evil, since it cleared away the Old London with its foul and close houses, and induced the erection of a new and more sanitarily built city. The great fire apparently gave the *coup de grâce* to the Great Plague, which prior to 1666 had swept from time to time across the country, but disappeared in that year, happily to return no more. The cessation of the epidemic plagues thus enumerated was doubtless due to the abolition or modification of the conditions under which they had previously flourished. Less crowding together of people and of their dwellings, a freer atmosphere, and a greater measure of cleanliness doubtless acted then as now in abolishing epidemics; but even in the 18th century smallpox, typhus or jail fever, scurvy, ague, and other diseases continued to be only too well represented as legacies of the ignorant and careless living which characterised the preceding era.

It is, however, in the 18th century that hygiene begins to appear on the social horizon with something of clear outline and defined aims, as a distinct branch of science, pursuing a very practical relation to the lives of men. The Black Death and other plagues had then disappeared as we have noted, and thus the chances of prolonged life had become materially increased in Britain and in other European countries as well. The sanitary historian of the 18th century has to take account of at least three great names as those of forerunners in the work of hygienic progress. John Howard (q.v.), the philanthropist, largely based his work of jail reform on improvement in the terrible state of these places of detention. They were overcrowded, and filthy in the hig
degree, and, as a consequence of these
tions, typhus fever (which is a disease
crowding) reigned rampant under the
'jail fever.' Howard by his undaunted
ceeded in clearing the jails of this pes
our criminals reap the fruit of H
thropy in the fact that the jail now
as the healthiest of dwelling-pla
exaggeration to say that if our h
rendered sanitary to the same ex
jails of our land, the death-rate wou
reduced to a minimum compared w
amount. Captain Cook, the navigator,
as the second of the sanitary pionee
century. He it was who first showed
scurvy, which is essentially a blood disorder,
from which whole ships' crews used to remai
prostrate in long voyages, was due to improper feeding. In one of his voyages Anson lost 600 out of 900 men from scurvy. Cook in a three years' voyage lost only four hands out of 118, and not one of these four deaths was due to the seaman's pest. He showed that in the absence of fresh vegetables, lime-juice should be served out regularly to ships' crews (see SCURVY). To-day Captain Cook's discovery is duly acted upon in the case of long voyages; and the extinction of scurvy in this fashion may be regarded as parallel in importance to the prevention of ague through the draining of the swamps and morasses amid the decaying vegetation of which the ague germs breed and multiply.

The third discovery of importance in sanitation in the 18th century introduces us to a feature in disease prevention which demands especial notice, because of the renewed importance which the principle in question has acquired in our own days. This feature may be called that of the *modification* of disease. It began, doubtless, far back in the history of eastern nations, if we are to credit Hindu records, but in 1720 Lady Mary Wortley Montagu, wife of the English ambassador to Turkey, introduced it to the notice of English physicians under the name of *inoculation*. This practice came into vogue as a preventive of smallpox in its pristine severity. Here smallpox matter, taken from the pustules of a person suffering from that ailment, was inoculated into the bodies of healthy persons. The result as a rule was that they acquired a mild attack of the disease, and this attack was found to prevent a future invasion of smallpox. Inoculation undoubtedly did not limit the spread of smallpox—indeed, as can be seen, it favoured its spread—but it undoubtedly tended to modify that loathsome ailment, and to prevent the dreaded scars and deformities which resulted from the disease in its full vigour. Later on came Jenner's discovery of *vaccination*. This practice began about 1796. Here matter taken from the pustules of cow-pox was used to 'vaccinate' the human being, the result being that a mild attack of cow-pox (or allied disorder) was given to children, and this was found, and still is found, in the vast majority of cases to be preventive of smallpox. The subject of vaccination need not be discussed here; reference may be made to the article on that subject; suffice it to say that since 1840, when vaccination began to be made the subject of legal enactment in Britain, and since 1853, when free vaccination was provided for the poor by law, smallpox has decreased both as regards frequency and severity. In 1867 vaccination was made compulsory for infants, and at the present time, even if it has not effected a universal escape from smallpox attack, we may congratulate ourselves upon a tremendous saving of life from this disease y its aid.

The advance of medical science—and especially e progress which has been made in microscopic rch into the causes of disease—together with education, and of a consequent intel- in health science among the people, erfully to awaken national endea- both of personal and public hygiene. w has stepped in, and has provided, suitable enactments (1848, 1875, gement in the pursuit of healthy tection against health dangers. ict is provided with its medical and with its sanitary inspec- es comprehend the abolition of he general supervision of drain- er sanitary details. To-day it may we possess a very fairly equipped ealth experts in every large town, able to assist and advise the citizens in the rge of their manifest duties to themselves and neighbours in the observance of hygienic ies. One of the most important enactments, for instance, is represented by the law which in many towns makes compulsory the notification to the authorities of every case of contagious disease which falls under the notice of the householder or medical attendant or both. In this way it is sought to limit the spread of those infectious ailments which add so largely to the death-rate each year. The authorities, being early informed of the appearance of any cases of these diseases, can take prompt measures for their isolation and their removal, if need be, to hospital. One case of smallpox, of typhus fever, or of scarlet fever may readily become, by neglect, the parent of thousands of cases, with a probable mortality frightful to contemplate; whereas by prompt isolation of the first case or cases misery, pain, loss of money, and chances of death may be saved to thousands. The seaports, too, are now narrowly watched by the health officers of these ports, and suspicious cases of illness on vessels arriving in harbour are at once dealt with. Cholera, it may be mentioned, which has run unchecked on the continent of Europe on several occasions within late years, has thus been warded off from the British coasts by the active supervision of the health authorities at the ports.

Within the sphere of the home health science has made of late years satisfactory progress. The principle of safe and sanitary drainage, whereby a house can be trapped off efficiently from the public sewers, and the inroads of sewer-gas (giving rise to typhoid fever and other ailments) prevented, is beginning to be everywhere practised. Plumbers are now encouraged to undergo examinations, instituted first of all by the Plumbers' Company of London, and to acquire thereby certificates of registration showing their knowledge of the principles on which house-drainage should be constructed. The vile 'scamping' work in the matter of drains so prevalent in former years, and so fraught with danger to the inmates of houses, it is to be hoped will be effectually banished from our midst. Here, as elsewhere, in sanitary science, the intelligent interest shown by the public in hygiene is beginning to bear fruit. The householder is no longer content to leave the sanitary arrangements of his house in the hands of ignorant architects or equally ignorant plumbers. His interest in his health affairs and his demand for sound sanitary work is a species of demand for which the inevitable supply is forthcoming in the shape of the increased attention now being paid to the construction of closets, baths, drains, lavatories, &c., and to the efficient protection of the house from the inroads of drain effluvia. In other details also the health of our homes is receiving the care it deserves. Questions of ventilation and of lighting are being studied anew, and the warming of houses is no longer left to chance. Personal health, which ranges in its extent from questions of foods and drinks to those of cleanliness and clothes, is not neglected amid the general improvement in hygienic education; so that the outlook in health questions is on the whole of the most hopeful kind. Happily the people at large are beginning at length to perceive and to act on the great truth that only by their personal education in hygiene, and by their knowledge and observance of health laws, can they secure the length of days which of old it was declared Wisdom bore in her right hand.

As a final point deserving of mention in relation to the acquirement of hygienic knowledge we may refer to the spread of knowledge regarding the exact causes of those infectious or zymotic diseases to which reference has already been made. These diseases include such ailments as smallpox, typhus fever, cholera, typhoid (or enteric) fever, measles, hooping-cough, diphtheria, scarlet fever, and like disorders. That they are responsible for a very large amount of our annual mortality is a stable fact, and it is interesting to note how the better knowledge of their causation bids fair to enable us to cope successfully with their attack. It is now generally admitted that each of these diseases arises from a specific living particle or *germ* which, sown in the body, under favourable conditions, gives rise to the disease in question. Each germ is derived from a previous case of the disease, and each disease, under ordinary circumstances, breeds true—that is to say, if we sow smallpox we reap smallpox, and not measles or scarlet fever; and so with every other disease. What is known as the 'germ theory of disease' has thus come to assume a paramount place and power in modern hygiene. Already we have become acquainted with the specific germs of many disorders. We know, for example, the *Bacillus tuberculosis*, or germ to which tubercle is due—consumption or *phthisis* being merely a form of tubercle, as that disease affects the lungs. The germ of relapsing fever is also known, and that of the splenic fever of cattle and sheep has been very fully studied. The fight of mankind against these fevers and allied ailments is thus in reality a combat with the germs to which they owe their origin. All attempts to limit these disorders by disinfection or otherwise are directed towards the destruction of the germs which are given off from each case of a given disease, and which, if allowed to escape into air or water, infallibly spread the ailment broadcast. The knowledge of the exact origin of such diseases is therefore a powerful weapon in the hands of the sanitarian. In other ways than by germ-destruction it is sought to protect man and animals against disease attack. Pasteur and others, by modifying the germs of a disease (e.g. those of splenic fever) by submitting them to varied conditions of temperature, &c., and by artificially propagating them in appropriate solutions, have succeeded in producing germs of altered and weakened power. These latter, used to inoculate animals, produce a mild form of the disorder, which protects against subsequent attack (see HYDROPHOBIA). This is the latest practical development of the germ theory itself. How far it may be extended to protect man against his enemies in the shape of disease germs the future alone can tell. Meanwhile, it is interesting to reflect upon the fact that there is at least a possibility of the abolition of many of the ailments which now affect us by the combined work of attention to the ordinary laws of health and the promotion of a high standard of physical development, and, it may be also, by the work of science in fortifying us by inoculation against the invasion of our disease enemies.

It may be added that the cause and advance of sanitation in England has been encouraged and assisted by various Health Exhibitions held in London and elsewhere, in which the latest sanitary inventions and appliances were shown. One of the fruits of the London Health Exhibition of 1884 was the publication of an admirable series of handbooks, written by eminent sanitarians and physicians, and dealing with the various phases of public and personal health. As regards the advance of sanitary science abroad, Germany has long evinced a thorough appreciation of the advantages of scientific instruction in hygiene, and the Sanitary Institute at Berlin, presided over by Dr Robert Koch, is in its way a model of what such an establishment should be. Laboratories for the study of public health science have been established in connection with most of the English universities; while the Royal College of Physicians of Edinburgh and the Royal College of Surgeons of London have built laboratories specially intended for the study of germ life, and for bacteriological investigations in relation to the production of diseases at large.

In the United States the supervision of health matters is delegated to Boards of Health, of which one exists in each state. These boards receive reports from medical officers and other experts, and publish each an annual report containing much suggestive matter for the guidance of health reformers and for the improvement of the public health at large. Quarantine, conducted on rational principles, with the rigid exclusion of diseases liable to be imported by immigrants, is made a notable feature of the sanitation of the United States.

See the articles BACTERIA, BATHS, COOKING, DIET, GERM THEORY, GYMNASTICS, HEALTH-RESORTS, HOSPITALS, HYDROPATHY, NURSING, MEDICINE, SEWAGE, VENTILATION, WATER-SUPPLY; also Parkes's *Hygiene* (1883); Galton's *Healthy Dwellings* (1880); G. Wilson's *Manual of Hygiene* (1886); Corfield's *Health* (1880); A. Wilson's *Manual of Health Science* (1885); Simon's *English Sanitary Institutions reviewed in their Course of Development and in some of their Political and Social Relations* (1890); B. W. Richardson's *Diseases of Modern Life*, and *The Common Health*; and his *Chadwick's Work and Works on Health and Social Reform* (1885).

**Hygrometer** (Gr. *hygros*, 'moist,' *metron*, 'measure'), an instrument for measuring the quantity of moisture in the atmosphere. The earlier forms of hygrometer depended upon the property possessed by some substances of readily absorbing moisture from the air, and being thereby changed in dimensions or in weight. Of this kind was the hair hygrometer of Saussure, in which a hair, which expands and contracts in length according as the air is more or less moist, was made to move an index; a similar instrument was the whalebone hygrometer of Deluc; but as other causes as well as moisture affect such instruments they afford no accurate indications. The most perfect hygrometer, theoretically, is that of J. F. Daniell (q.v.). It consists of two bulbs connected by a bent tube, as represented in the figure, and enclosing a thermometer, together with some ether and vapour of ether, the air having been expelled. The bulb *b* is covered with muslin, and *a* is either blackened or coated with metal. The observer's hand is placed for a short time on *b*, to drive the ether into *a*, leaving *b* and the tube filled with vapour of ether. A little ether is then dropped from a flask, of the form *c*, on the muslin-covered bulb; evaporation instantly takes place and produces a cooling of *b*, which condenses the va

a fresh evaporation from *a* fills the v

is again condensed by dropping ethe

process is repeated till the temper

reduced by successive evaporations

TION) that *dew* begins to be form

of the bulb. At the instant this

of the mercury in the two therm

ately noted, *the one giving the de*

ture, and the other the tempera

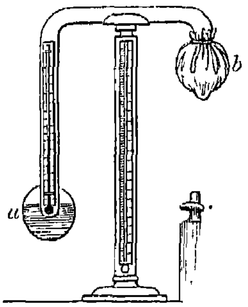
The actual quantity of moisture

cubic foot of air can now be readily fo

following empirical formula: weight of m

grains $= \frac{5656\cdot2}{448+t} \times p$; where $t$ is the temperatur

the air at the time of observation, and $p$ (found *from tables) the elasticity of vapour at the temperature of the dew-point.* The evident defects of this instrument are, first, its rapidity of operation, so that no time is allowed for the glass, ether, and thermometer to come to the same temperature, and in consequence the dew-point is given higher than it actually is; secondly, its costliness, owing to the great consumption of ether; and, thirdly, its uselessness in tropical countries, owing to the difficulty of preserving the ether in a fluid state. Daniell's hygrometer was used at the Royal Observatory, Greenwich, from 1840—the commencement of meteorological observations—till 1847, when it was superseded by the more convenient instrument, the Wet and Dry Bulb Thermometers. This instrument consists of two ordinary thermometers: one has its bulb bare, and thus shows the temperature of the air; the other has its bulb covered with



muslin, which is kept wet by a cotton wick dipping into water. The evaporation from the muslin, and consequent cooling of the bulb, being in proportion to the dryness of the air, the difference between the readings of the two thermometers is greatest when the air is driest, and zero when it is completely saturated. The readings of the thermometers being taken, the elastic force of vapour at the dew-point is calculated by the formula of Dr Apjohn:

$$(1)\ F=f-\frac{d}{88}\cdot\frac{h}{30};\ (2)\ F=f-\frac{d}{96}\cdot\frac{h}{30};$$

the first formula to be used when the wet thermometer is above, and the second when it is below the freezing-point (32°). In these formulæ F is the elastic force of vapour at the dew-point, which has been determined for different temperatures by Regnault from carefully conducted experiments; $f$, the elastic force at the temperature of evaporation (or reading of wet bulb); $d$, the difference between the dry and wet bulbs; and $h$, the height of the barometer. From this the quantity of moisture in a cubic foot of air, &c. can be found as before. To dispense with these troublesome calculations the *Hygrometric Tables* of Mr Glaisher may be used, except in very dry states of the atmosphere, such as occasionally occur on Ben Nevis and very dry climates, when Dr Apjohn's formula must be used.

**Hygroscope** is a name sometimes given to an instrument for indicating the presence of moisture in the atmosphere, without measuring its amount. Hygroscopic substances are those which imbibe moisture and become coated with a moist film.

**Hyksos,** or SHEPHERD KINGS. See EGYPT, Vol. IV. p. 239.

**Hymen,** or HYMENÆUS, in Greek Mythology, the god of marriage; but originally the word seems to have denoted only the bridal-song, which was sung by the companions of the bride as she went from her father's house to that of the bridegroom. The god Hymen is first mentioned by Sappho. The legends concerning his birth and descent are [illegible]us; but he is generally said to be a son of [illegible] and some one of the Muses. He is represented [illegible] youth with wings, a bigger and graver [illegible] a bridal torch and a veil in his hands.

**[illegible]tera** (Gr., 'membrane-winged'), an [illegible], including (*a*) ants, bees, wasps [illegible]h stings; and, in a lower division, [illegible]w-flies, and ichneumon-flies (Tere[illegible] which the abdomen of the female [illegible] ovipositor. The mouth parts are [illegible] for biting and sucking. The wings [illegible] four, membranous, and with com[illegible] few veins; they may be caducous or [illegible] the second pair is always smaller than the [illegible] The metamorphosis is complete. Both in [illegible]ucture and intelligence the hymenoptera occupy [illegible] high place among insects, and indeed among [illegible]nimals. Their characteristics will best be gathered [illegible]rom the study of special types. See ANT, BEE, GALL-FLY, SAW-FLY, WASP, and INSECTS.

**Hymettus,** a mountain (3368 feet) in Attica, now called Trelo Vouni, situated to the south-east of Athens, was famous among the ancients for its honey and its bluish marble. The honey is still in repute.

**Hymn.** The usually accepted definition of a Christian hymn is that of St Augustine: 'Do you know what a hymn is? It is singing with the praise of God. If you praise God and do not sing, you utter no hymn. If you sing, and praise not God, you utter no hymn. If you praise anything which does not pertain to the praise of God, though in singing you praise, you utter no hymn.' The hymns of the church which are known to us as existing at the time these words were written (*c.* 415) were mainly of the character thus defined. With the spread of Christianity, however, changes took place which gave rise to another and broader meaning to the hymn. The expansion of church life and the development of doctrine and practice required that fuller liberty should be extended to sacred song. The outcome of this expansion of the original idea and form of the hymn has resulted in the accumulation of vast stores of sacred lyrics, a large proportion of which have passed from time to time into public use in divine worship. The languages and dialects represented therein number more than two hundred.

I. *New Testament Hymns.*—The early history of Christianity is in our Sacred Books; and to them we must go for the first examples of Christian song—the Magnificat, the Benedictus, the Angelic anthem (see DOXOLOGY), and the Nunc Dimittis. The fourfold record of our Lord's ministry contains no other songs. In the Acts of the Apostles we read of hymns being sung; but of their structure and contents we have no example. On turning to the epistles of St Paul, St James, and St Peter, we have some indications of the nature of the hymns which were then sung. Fragments of what, to every appearance, were familiar hymns in the early church are found therein, some of which are known as the 'faithful sayings' of Holy Writ. These include 'Awake thou that sleepest,' &c., Eph. v. 14; 'If we die with Him, we shall also live with Him,' &c., 2 Tim. ii. 11, 12; 'Manifest in the flesh, justified in the spirit,' &c., 1 Tim. iii. 16; and others, as 1 Tim. vi. 15, 16, Titus, iii. 4-7, and James, i. 17. The songs which St John heard in vision, although true lyrics, cannot be classed as early Christian hymns.

II. *Greek.*—(1) In Greek, the mother-tongue of Christianity, it is natural for us, when we have closed the Sacred Record, to search for the earliest forms of sacred song. In the Ante-Nicene period we have a few only, some of which are written in the classical metres, and others which are 'more oriental in character, and have an affinity to the Hebrew modes.'

Of the former the best-known instance is that of Clement of Alexandria (died 220?), translated by Dr Dexter as 'Shepherd of tender youth.' Although Clement's authorship is not beyond doubt, yet it is essentially a hymn of his day, and is absolutely confined, in its subject-matter, to the incidents and doctrines of Holy Writ. The hymns and poems of Gregory of Nazianzus (330-389) are all in classical measures. They were probably written after 381, and number about 240 in all, of which 38 are dogmatic, 40 are on moral subjects, 99 relate to his own life, and 60 more are on miscellaneous subjects. Although amongst these sacred pieces there are several splendid hymns, we know not one in a modern hymn-book. Some of the finest are easily attainable in the original in Christ and Paranikas's *Anthologia Græca Carminum Christianorum* (1871), and in a translated form in A. W. Chatfield's *Songs and Hymns of the earliest Greek Christian Poets* (1876). Another writer in the classical metres was Synesius (375-430). He was an eloquent bishop, and well read in the philosophy of his own and of older days. His ten hymns are also printed in the *Anthologia Græca*, and translated by Mr Chatfield and by Alan Stevenson (1865). One of these hymns, translated by Mr Chatfield as 'Lord Jesu, think on me,' is given in a few modern hymnals. 'Though of great spirit, reality, and beauty,' the 'hymns of Synesius lie confessedly on the borderland of Christianity and Neoplatonism, and often it is the Platonic rather than the specially Christian thought that inspires his most refined passages' (*Dict. of Hymnology*, p. 457). The hymns of Sophronius, patriarch of Jerusalem (629), are of a still later date, as are also those of Elias Syncellus and St John of Damascus. Of these hymns in the classical measures none, except three canons of St John of Damascus, were incorporated in the services of the Eastern Church.

(2) The link of connection between the Jewish

and the Christian hymnody is found not only in the use which was made from the very first of the Jewish Psalter in Christian worship, but also in the adoption of the ancient 'Hallelujah' and 'Hosanna,' and in the alphabetical and other forms of Christian antiphons and versicles. The primitive Greek hymns, as distinct from hymns of the New Testament on the one hand, and the sacred poems in classical metres on the other, were largely derived from Holy Scripture.

The *Ter Sanctus* is an expansion of Isaiah, vi. 3, and usually reads 'Holy, holy, holy, Lord of Sabaoth: Heaven and earth are full of His glory. Blessed art Thou for ever. Amen.' The germ of the *Gloria in Excelsis* is the Angelic song at Bethlehem. The Greek form of the *Gloria Patri* ('Glory be to the Father,' &c.) seems to have had its origin in Our Lord's commission, 'Go ye therefore . . . . baptising them in the name of the Father, and of the Son, and of the Holy Ghost.' Besides these, the *Trisagion*, 'Holy God, Holy and Mighty. Holy and Immortal, have mercy upon us;' the *Cherubic Hymn* of the Greek liturgies, 'Let us who mystically represent the Cherubim, and sing the holy hymn to the Quickening Trinity, lay by at this time all worldly cares, that we may receive the King of Glory, invisibly attended by the angelic orders. Alleluia, Alleluia, Alleluia;' the hymn of Justinian, 'Only-begotten Son and Word of God,' &c.; and various clauses in the *Te Deum* are all based upon separate or accumulated passages of Holy Scripture.

There are also the hymn at lamp-lighting, widely known through Keble's translation, 'Hail! gladdening Light,' which was old in St Basil's time (370); 'The Virgin's Song' of Methodius (died c. 311), translated by Mr Chatfield as 'The Bridegroom cometh!' but not in liturgical use in ancient or modern times; and a few others. Early Greek hymns are few in number but of fine quality, and deal almost exclusively with scriptural subjects.

(3) The liturgical use of hymns in the church's infancy does not seem to have been extensive. Both Pliny and Justin Martyr bear testimony to their use in public worship, and we know that some were in use in the church of Antioch in 260. 'Yet as late as the 4th and 5th centuries there was a scruple against the use of anything but psalms in the eastern monasteries, and in Spain the Council of Braga (561) forbade the use of hymns' (*Dict. of Hymnol.* p. 460). Ultimately, however, the popularity and power of hymns became so marked through their use by the heretics, and their employment as a countercheck by the faithful, that their exclusion from divine worship became no longer possible. The change was on a limited scale at first, but after the complete separation of the Eastern from the Western Church the hymn in its various forms gradually assumed a prominent and permanent position in the Greek liturgy.

(4) It has been pointed out that the principal link between the early and later hymns is found in a group of pieces discovered by Cardinal Pitra in two rare liturgical MSS. at Moscow and Rome (Cardinal Pitra's *Analecta Sacra Inedita*, Paris, 1876).

(5) The next period (600-900) is that in which we have the building up of those elaborate service-books of the Greek Church, known to us as the *Menæa*, the *Greater Octoechus*, the *Lesser Octoechus*, the *Triodion*, the *Pentecostarion*, the *Euchologion*, and the *Horologion*. In these works the number and variety of hymns are very numerous. The hymn-writers of this period were associated at first with Jerusalem and other parts of the Holy Land, and subsequently with Constantinople.

(*a*) The *first group* includes St Andrew, Archbishop of Crete (660-*c.* 732), who is known as the author of several canons, triodia, and idiomela, including the great canon of the Mid-Lent week. To the English reader he is best known through the cento, made by Dr Neale, 'Christian, dost thou see them?' Almost contemporary with him was St Cosmas, a monk of St Sabas, near Jerusalem, and afterwards Bishop of Maiuma, near Gaza, who died *c.* 760. He was the author of several pieces, including a canon for Christmas Day, beginning in Dr Neale's translation, 'Christ is born! tell forth His fame.' At St Sabas with Cosmas was John of Damascus, who became a tower of strength in Greek hymnody. Born at Damascus, he accompanied his foster-brother, Cosmas, to St Sabas, and there he wrote his theological works and his hymns. Late in life he entered the priesthood, and died at a great age (*c.* 780). His influence upon later Greek hymnody was very great. He arranged the *Octoechus* in accordance with the Eight Tones, and supplied it with several canons of great merit. His canons are his finest work, that for Easter (beginning in Dr Neale's translation, ''Tis the day of Resurrection') being well known, in part at least, to the English reader. Within the next fifty years St Theophanes, a native of Jerusalem, also of St Sabas, and afterwards Archbishop of Mida, was writing extensively on the martyrs and confessors of the Greek Calendar, which took the form of canons and idiomela. Although largely represented in the *Menæa*, he is almost unknown to the English reader.

(*b*) The *second group* of hymn-writers were associated with Constantinople. The first of these is Joseph the Hymnographer (died 883), a native of Sicily, but afterwards founder of a monastery at Constantinople. He was one of the most voluminous of the Greek poets, and is largely represented amongst the canons in the *Menæa*. His canon for Ascension Day is very fine. Of it, however, but a small portion is familiar to English readers, Ode iv., translated by Dr Neale as 'Jesus, Lord of life eternal,' being the best known. 'Let our choir new anthems raise,' and 'Stars of the morning so gloriously bright,' are also translations by Dr Neale from St Joseph. St Joseph of the Studium, sometime Bishop of Thessalonica, wrote several pieces; but none of them have been translated into English. His elder brother, St Theodore of the Studium (died 826), wrote several canons, notably that on the Judgment, translated by Dr Neale as 'That fearful day, that day of speechless dread,' and regarded by Neale as 'undoubtedly the grandest judgment-hymn of the church previous to the *Dies Iræ*.' He also wrote 'A song, a song of gladness,'
which is a part of his triumphal canon on the victory
the Icons. Methodius II. (died 836) also belongs
group of poets. Of the few pieces which h
Neale has translated one only, 'Are thy t
increasing?' and has given it as by St M
error. Theoctistus of the Studium (*c.*
Neale to have been a friend of St Josep
represented in Greek hymnody. He is
readers through Dr Neale's translation
'Suppliant Canon to Jesus,' as 'Jesu
above,' and the Rev. R. M. Moorson
same, 'Sweet Saviour, in Thy pitying

(6) From this date to the 16t
the Greek service-books were p
against new compositions, very
known. We have Metrophanes
Euthymius (died 910); Constantine
genitus (913-959); Leo VI. (died 917);
Mauropus (died 1060); and Philotheus, Patr
of Constantinople (died 1376); but only one
two pieces by these writers have been rendered into English.

III. *Syriac* (*170-1370*).—Syriac hymnody deals with the churches of Syria, Upper Mesopotamia, and western Persia. Its history extends from the 2d to the 14th century.

The earliest known hymn-writer in this language is Bar-Daisan (Bardesanes, q.v.), born in 154. His son Harmonius was also a hymn-writer. Both father and son had Gnostic tendencies. On the orthodox side we have Simeon bar Sabbae, Bishop of Seleucia, who suffered martyrdom in 296; and the greatest of all, Ephraem Syrus (q.v.; *c.* 306-378). His poetical writings were numerous, and included homilies, discourses on Christ's Nativity, the Creation, and other subjects. Most of the Syriac hymns and hymnists are practically unknown to the western world. In the East, however, these hymns form a considerable portion of the service-books of the various divisions of the Syriac churches to the present day. Their English use is very limited. The best-known example is 'Glad sight, the holy Church,' by the Rev. F. Pott.

IV. *Latin.*—(1) No name is associated with Latin hymns until after the Council of Nicæa, 325. Almost immediately afterwards we have three great contemporary writers: in Greek, Gregory of Nazianzus (330-389); in Syriac, Ephraem Syrus (306-378); and in Latin, St Hilary (died 368). The most celebrated of the hymns attributed to the last is the 'Beata nobis gaudia Anni reduxit orbita,' which has been in western liturgies from an early date. St Ambrose (*c.* 340-397) was almost a contemporary writer with the above three. About 100 hymns are attributed to him, but of these only twelve are accepted by the Benedictine editors of his works, including 'Æterna Christi munera,' 'Deus Creator omnium,' 'O Lux beata Trinitas,' and 'Splendor Paternæ gloriæ.' The rest, being in his style and after his manner, are known as Ambrosian hymns. Most of the latter and all of those by St Ambrose are found in the early liturgies of the Western Church. Prudentius (350-410) did not write hymns, but sacred poems, from which portions were taken and incorporated as hymns *in the services of the church.* For this purpose these extracts were admirably suited and widely used. His 'Corde natus ex Parentis,' which was taken from his poem 'Da, puer, plectrum,' in his *Cathemerinon,* is a good example of this mode of treatment. The 63d edition of Prudentius' *Poems* was published at Leipzig in 1860. This is a splendid testimony to his worth. Sedulius, a contemporary of Prudentius, is known in hymnology by one piece, 'A solis ortûs cardine, Ad usque,' of which the second portion, 'Hostis Herodes impie,' is used as an Epiphany hymn in several early breviaries, and altered, as 'Crudelis Herodes Deum,' in the modern Roman Breviary. The 6th century embraces two names of great repute: Venantius Fortunatus (530-609), and Gregory the Great (540-604). Fortunatus' *Poems* are extant in eleven books. Some ten [illegible] twelve hymns bear his name, but his right [illegible] of these is contested. His grandest [illegible] are the Passiontide hymns, 'Vexilla [illegible]unt' and 'Pange lingua gloriosi præ-[illegible]is.' Gregory's accredited hymns are [illegible] including 'Audi benigne conditor,' [illegible]is,' 'Rex Christe factor omnium,' [illegible]rgitor præmii.' The fairly well [illegible] hymns of the Venerable Bede (673-[illegible] or twelve only at the utmost, [illegible] Hymnum canamus Domino,' and [illegible]ntes martyrum.' Another hundred [illegible] Paul the Deacon (died *c.* 799) and [illegible]ph of Orleans (died 821), the 'Gloria [illegible] honor' of the latter being long and well [illegible]wn as a processional hymn for Palm Sunday. [illegible] Rabanus (776-856), with his 'Christe Sanctorum decus Angelorum,' and St Odo of Cluny (879-942), with his 'Lauda mater ecclesia,' should be mentioned, as also Fulbert of Chartres (died 1028), author of the 'Chorus novæ Hierusalem,' and Robert II., king of France (972-1031), though their claims to hymn-writing are open to question.

(2) Although this brings us to the beginning of the 11th century, the hymn-writers whom we have been enabled to cite are comparatively few. Most of them, however, are names of great standing, and are towers of hymnological strength. When, however, all the compositions of these writers are collected together we still find in the ancient Latin service-books and other MSS. a mass of hymnological literature for which no authorship can be found. This is also the case with regard to the succeeding centuries, and more especially with respect to the Prose or Sequence.

(3) Notker Balbulus (*c.* 840-912), the father of sequence-writing, was a member of the Benedictine monastery of St Gall, his principal work being literary and scholastic. In connection with divine worship he found it difficult to remember the musical notes (*neumes*) set to the 'Alleluia' (specially to the final *a*), which were sung between the reading of the Epistle and the Gospel. The adapting of words to these *neumes*, instead of sounding them as musical notes only, was suggested to him by another, and the result was a series of Sequences, or, as we now call them, hymns, which to the number of 115 are known as Notkerian Sequences, but of which less than fifty are by Notker. Of those who followed Notker in this mode of composition Adam of St Victor (an abbey at Paris) was the most prominent. The service-books of the middle ages abound with these compositions, but the greater proportion by far are anonymous. The Notkerian Sequence which is best known to the English reader is that for the Epiphany, translated by Dr Neale as 'The strain upraise of joy and praise. Alleluia.'

(4) Whilst the work of composing hymns and sequences was thus prolific, a few names of great note stand forth in their grandeur as composers of sacred poems as distinct from hymns. It will be sufficient to name St Bernard of Clairvaux (1091-1153), and his grand Passiontide poem 'Salve mundi salutare,' and his contemporary, Bernard of Cluny, with his splendid 'Hora novissima,' to show the nature and character of the work which was done.

(5) The hymns, sequences, and poems referred to above, to the number of several thousands, are those which date from before the 16th century. Some hundreds more were added to the stores of Latin hymnody by the brothers Santeüil and others in the Cluniac (1686), the Paris (1736), and other breviaries in France, additions to the latter being as late as 1820. As to the use made of this mass of sacred poetry, we may add that two thirds or more have been associated directly with divine worship, and the rest are connected with works of private devotion; and that nearly one-fourth have been translated into English.

V. *English.*—English hymnody is a very wide subject, and, if we include therein Anglo-Saxon compositions, it dates from Cædmon (died *c.* 680). Bishop Aldhelm (died 709) sang sacred poems in the vernacular, and is said to have rendered the Psalter into metre; in Chaucer (1340-1400) we have an early English hymn to the Blessed Virgin; in 1414 T. Brampton's Seven Penitential Psalms, and later carols and additional hymns to the Blessed Virgin Mary. The first instalment of hymns in the vernacular of any moment were those translated from the Latin, and included in the Primers which were issued both before and after the Reformation. These translations were followed by others, some of which are preserved to us in the Book of Common Prayer. Translating, however, soon gave way to paraphrasing, and Latin and German hymns to the Book of Psalms. The supplying of the need occasioned by the suppression of Latin hymns in divine worship at the Reformation, by the introduction of the Paraphrase instead of the hymn, is a history in itself. We can only say that from 1561 to 1696 the authorised book in the Church of England was the 'Old Version' of Sternhold and Hopkins, and from the latter date to the adoption of modern hymn-books, the 'New Version' of Tate and Brady. In the meantime the foundations of English hymnody were being extended. A *résumé* of the work done in the Elizabethan age is given in E. Farr's *Select Poetry, chiefly devotional, of the Reign of Elizabeth* (Parker Soc. 1845). The specimens given are either from books of poetry or works of devotion, and are pious utterances in quaint and rugged verse. Later attempts in the same direction, by Dr Donne in his *Poems* (1633), G. Herbert in his *Temple* (1633), C. Harvey in his *Synagogue* (1640), and others, were of a higher stamp, and bore a *greater affinity to the modern* hymn. At that time no use of these compositions was made in public worship, except in the case of private institutions. The hymn 'Jerusalem, my happy home,' and others of more than usual excellence are of this period.

The first English hymn-book was the *Hymns and Songs of the Church* (1623), by George Wither. The king granted him a patent to bind up the book with the Metrical Psalms; but the whole matter resulted in a failure. In 1641 Wither republished the same, with a few alterations, as *Hallelujah, Britain's Second Remembrancer*, and dedicated it to the Long Parliament, but with no better success. The writings of Herrick, Henry Vaughan, William Barton, Bishop Jeremy Taylor, Samuel Crossman, Richard Crashaw, John Austin, Bishop Thomas Ken, and others bring us down to 1737, when the first hymn-book of the modern type (in which the original hymns of various authors are interspersed with translations from other languages) was published by John Wesley for use in the Church of England.

(1) *Church of England.*—The title of Wesley's book was *Collection of Psalms and Hymns* (Charlestown: printed by Lewis Timothy, 1737). The versions of psalms, the translations from Greek and German, and the original compositions were seventy in all. Wesley and his brother Charles soon changed the style of their hymnological productions, and from 1740 to 1780 (the date of the Wesleyan hymn-book) published only their own compositions. John Wesley's hymnological work for the Church of England remained a dead-letter until 1760, when Martin Madan published his *Collection of Psalms and Hymns*, gathered by him mainly from the Wesleys and Isaac Watts, altered without permission to suit his Calvinistic views, and published without leave.

During 1760–1800 nearly twenty distinct hymn-books were issued. Taken as a whole they were Calvinistic in doctrine, crude in arrangement, and indebted to the Wesleys and Nonconformists for seven-eighths of their contents. Three writers only stand out during this period with marked distinctness—A. M. Toplady, John Newton, and William Cowper. During the next twenty years nearly one hundred hymn-books were issued for use in the Church of England, and the places of publication extended to almost every county in the country. Naturally these books varied in their contents; but their general doctrinal tone was distinctively Calvinistic. There was also a greater and more uniform recognition of the order of the Book of Common Prayer than before. The years 1820 50 produced another hundred of hymn-books, amongst them Bickersteth's *Christian Psalmody* (1833–41), Elliott's *Psalms and Hymns* (1835), and Hall's *Mitre Hymn-book* (1836). Other works of importance were Bishop Heber's posthumous *Hymns* (1827), Miss Auber's *Spirit of the Psalms* (1829), Bathurst's *Psalms and Hymns* (1831), and Lyte's *Spirit of the Psalms* (1834), the contents of which, in each instance, were mainly by the same writer. During this period also this store was richly increased by the publication of Keble's *Christian Year*, by the original compositions of several other writers, and by renewed efforts at translation of German and Latin hymns. This immense growth broadened out considerably, and brought the subject of hymnody strongly to the front during the next ten years. The outcome was the publication of over fifty hymn-books in that period, a great accumulation of original hymns and translations, the gradual exclusion of nonconformist hymns, except those of the higher class, from the collections, and a new and intense interest in the whole subject. Additional translations from the Latin and German, together with original compositions of great merit, created a longing for something better in the form of a hymn-book for public use. *Hymns Ancient and Modern* (1861) was one answer to this request. Its success was phenomenal. On the one hand it raised a storm of opposition: on the other, during the next twenty-five years it called forth several important works on hymnology, various collections of sacred lyrics for private use, about fifty 'supplements' to and editions of books in common use, and nearly one hundred new hymn-books. Since then new writers whose names have become household words have arisen, and the needs of the increased activity of the church have been met. In the past one hundred and fifty years the Church of England has produced about five hundred hymn-books, and nearly two hundred and fifty authors and translators whose works have been at one time or another in use in public worship. Taken together their original hymns and translations will number ten thousand.

(2) *English Nonconformists.*—The hymnological work which has been accomplished outside of the Church of England is large and important, and has had great influence in all English-speaking countries. A few facts only can be set forth in each instance.

(*a*) *The Baptists* from the first quarter of the 17th century to the present have been divided into two sections, the Particular or Calvinistic, and the General or Arminian Baptists. The singing of hymns with the former began with B. Keach, about 1673. It had a stormy birth and childhood, for opposition thereto was great, but at the present time hymn singing is a distinctive feature in their worship. The General Baptists also have their official hymn-books, and singing is an essential part of their worship. English Baptist writers number about one hundred, and their hymns two thousand.

(*b*) *The Congregationalists* or Independents used hymns in public worship some thirty years before the Baptists. Their hymn-books have been many, and their writers numerous. The latter number over a hundred, and their hymns three thousand or more. Although I. Watts, P. Doddridge, and J. Conder are their pride and towers of strength, there are others who have written lyrics of great force and beauty.

(*c*) *The Methodists* are broken up into several sections, as the New Connection (1796), Primitive Metho[illegible] (1810), the United Methodist Free Churche[illegible] amalgamated body dating from 1857), and [illegible] Christians (1815). The first official hymn[illegible] old body was published by J. Wesley in 1[illegible] groundwork of all the hymn-books of the va[illegible] of Methodism—the Primitive Methodist[illegible] Usually Methodist hymnody is said to [illegible] influence upon English hymnody eve[illegible] however, is only true of the hymns of [illegible] Wesley.

(*d*) *The Unitarians*, although nu[illegible] body, have produced several hymn-writer[illegible] Of their present hymn-books the best is D[illegible] *Hymns of Praise and Prayer* (1873), w[illegible] equalled amongst Unitarians.

(*e*) *Other Denominations*, as the Irvingites, the Swe[illegible]borgians, the Salvation Army, and many others h[illegible] each their authors and official hymn-books. The writers and books, however, do not call for special notice.

When the English hymn-writers are counted up and their works are tabulated, we have a total of one thousand writers, and twenty-five thousand hymns.

VI. *Irish.*—The Roman Catholics, the Protestant Episcopalians, the Presbyterians, the Methodists, and others in Ireland have been so closely identified with their brethren in England and Scotland that in many instances the same books have been in use in the three countries. The result has been that Ireland has not shaped a hymnody for herself, although in later years a few hymn-books have been published independently. Hymn-writers associated with Ireland, however, are numerous, from St Patrick (*c.* 425) to Mrs Alexander and Dr Monsell.

VII. *Welsh.*—There are references in Welsh history which go to show that some of her ancient bards sang hymns of praise to God as early as the 6th century. The most ancient productions now extant date from the 14th century. After the Reformation the lead was taken by the Established Church, by the publication of Archdeacon Prys's version of the Psalms in 1621. Since then hymn-writing has increased somewhat rapidly, especially since the Methodist movement early in the last century; and at the present time the Established Church and the numerous Nonconformist bodies have each their official or quasi-official hymn-books. Welsh hymnody, although very powerful in the principality, has had little or no influence upon the hymnody of other countries.

VIII. *Scottish.*—One of the most interesting parts of Scottish hymnody is the history of the Scottish Psalter, a work which is interwoven with Scottish history, and has had a powerful influence upon the Scottish mind. The first effectual step taken to provide hymns, as distinct from psalm-versions, for public worship in Scotland, was the appointment of a committee of the General Assembly in 1742. This committee presented a draft collection, which was authorised for private use in 1745. The same year a committee was appointed to revise and enlarge the draft for public use. The result was published in 1781 as *Translations and Paraphrases, in Verse, of several Passages of Sacred Scripture*, &c. Of the total contents (sixty-seven in all, not counting the five hymns added at the end) twenty-five are by Watts, five by Doddridge, and two by Tate, the rest being by M. Bruce, T. Blacklock, H. Blair, W. Cameron, J. Logan, J. Morison, and other Scottish writers.

Although the addition of the five hymns to the Paraphrases indicated a desire for a larger choice of hymns in public worship, nothing definite and official was done by the principal sections of Presbyterianism until the publication of the *Hymn-book of the Relief Church* (1794), the *Hymn-book of the* [illegible]*ed Presbyterian Church* (1852), *The Scottish* [illegible]*l* of the Established Church (1870), and the [illegible]*ions, Paraphrases, and Hymns of the Free* [illegible]). Since these dates these books have [illegible] revised, added to, or superseded. Out[illegible] sections of Presbyterianism much [illegible]n shown in hymnological work by [illegible]uals amongst the Presbyterians, in [illegible]piscopal Church, the Evangelical [illegible]aptists, the Congregationalists, the [illegible]ndemanians, Roman Catholics, and [illegible]come of which is a mass of hymno[illegible]ature, of which a good proportion is of [illegible]origin and of high merit. Amongst the [illegible] to one hundred Scottish authors and trans[illegible]rs whose hymns have taken a high place in the hymnody of the church the most eminent are J. Morison, R. Blair, S. Martin, W. Robertson, H. Bonar, Jane Borthwick, M. Bruce, J. D. Burns, Sarah Findlater, R. M. M'Cheyne, H. M. Macgill, and R. Wardlaw. The prince of these hymn-writers and the Charles Wesley of Scotland is Dr Horatius Bonar (1808-89).

IX. *American.*—The first book printed in America was the Bay Psalter (1640), consisting of various metrical versions of the Psalms by English authors. The addition of a few spiritual songs in the 2d edition of 1647 was the first departure from the sole use of psalm-versions in that country. This small beginning had at the first a very slow development. The years 1780-1800 witnessed the general recognition of hymns. The Protestant Episcopal Church extended their collection in 1789 to twenty-seven hymns: a collection by the Baptists (the second) was published in 1790; the Congregationalists had their *Hartford Selection* in 1799; the Wesleyan Methodists a reprint of a *Pocket Hymn-book* originally published at York, and revised after some years of use in 1802; the Universalists, two collections in 1792; the Unitarians, a selection in 1795; and the Presbyterians, Watts at first, and then an official collection in 1828. In these books American hymn-writers had a very limited representation, most of the hymns being by English authors; but year by year the American element became more pronounced as hymnal followed hymnal in the various religious communions. In 1800 an original hymn by an American was a novelty in any collection; now no American hymn-book of the highest class can do with less than two hundred and fifty authors and translators, and of these not less than fifty should be Americans. This percentage, as the outgrowth of some eighty years, is remarkable. Each religious communion has done its part in bringing about this great result. Of the two hundred and fifty authors and translators, the Baptists and the Unitarians number over forty-five each, the Congregationalists about forty; the Protestant Episcopalians and the Presbyterians about thirty each, the Methodists less than twenty, and the Universalists about ten. The remaining thirty include Quakers, Reformed Germans, Reformed Dutch, &c. Several of these writers have an European reputation, as Bishop Coxe, Bishop Doane, C. W. Everest, and W. A. Mühlenberg (Episcopalians); T. Hastings and J. W. Alexander (Presbyterians); H. M. Dexter, T. Dwight, and Ray Palmer (Congregationalists); P. Bliss, Lydia Sigourney, and S. F. Smith (Baptists); Fanny Van Alstyne and W. Hunter (Methodists); S. G. Bulfinch, W. C. Bryant, W. H. Burleigh, Emerson, Holmes, Longfellow, S. Longfellow, Lowell, and E. H. Sears (Unitarians); and the Quaker poet Whittier.

The number of hymn-books published in America during the past hundred years accounts to a great extent for this great activity in hymn-writing. At the present time each denomination, and there are many, has its official hymn-book, or its quasi-official book or books. For good work opportunities for publication thus abound, and the finer productions are assured a certain circulation and a possible immortality.

X. *French.*—The French metrical psalters have a history distinct from French hymns and hymn-books. The complete psalter of Marot and Beza (1552-62) was the psalm-book of the Reformed Church until its place was to some extent filled by the new version of Conrart (1677-79), and the revision of the same by Pictet and others in 1695. As in other countries, the psalter subsequently gave way to the hymnal, and the versions of private individuals were mainly of public value in proportion as they yielded suitable pieces for the same. The writing of hymns in the vernacular began in the 16th century as in Germany and elsewhere with translations from the Latin. The Roman Catholics, the Huguenots (in their day), the Reformed Church, the French Moravians, the Methodists, and various evangelical societies, have each their book or books of hymns for divine worship, in which, although there are original compositions by French authors, the larger proportion are translations from English and German hymns. *The Réveil* has produced the greatest French Protestant hymn-writers, at the head of whom stands César Malan (1787-1864), whose printed and MS. hymns number about one thousand. Associated with him, directly or indirectly, in the same religious movement were Ami Bost, H. Empaytaz, Merle d'Aubigné, Felix Neff, Henri Lutteroth, A. Vinet, A. Monod, and others, men of world-wide reputation and influence, who have given a position to French hymnody unknown to it before.

XI. *German.*—In the German language there are not less than one hundred thousand hymns, of which about ten thousand have passed into German hymn-books of various dates, and nearly a thousand are regarded by German critics as classical. The first were contemporary with the earliest Latin sequences of St Notker and others; the last are the productions of living men.

(1) *The First Period* begins with Otfrid of Weissenburg (*c.* 868), and was continued by others until the time of Luther. The greater part of the hymns of this period were translations from the Latin, and all were in strict doctrinal accord with the Church of Rome.

(2) *The Second Period* (1520-1648) opens with the hymns and psalm-versions by Luther, and embraces the Reformation period to the peace of Westphalia. The principal writers were Luther, Justus Jonas, Alber, Spengler, Hans Sachs, Speratus, N. Decius, and others. The writings of these authors reached to about 1570, and have a distinct churchly character of their own. From 1577 to 1618 hymn-writing and hymn-book making continued very much on the old lines, and numbered amongst the writers Selnecker, Ringwaldt, Herberger, and P. Nicolai. The miseries of the Thirty Years' War changed the whole aspect of hymn-writing for a time by the introduction of a strong personal element of faith and courage, and hope begotten of suffering. The names of a few of these writers will recall some of the finest hymns of this kind in the German language: Opitz, Heermann, M A. von Löwenstern, Altenburg, Rinkart, Dach, and Rist.

(3) *The Third Period* was a transitional one, and led up to the Pietistic and Moravian writers of the next era. It had amongst its hymn-writers P. Gerhardt, Franck, Neumark, Scheffler, and Louise Henriette of Brandenburg. Of these the greatest were Gerhardt, who is second only to Luther in German hymnody, and Scheffler, whose love for Christ was first in everything. This orthodox, mystic school, with its deep experimental piety, was soon lost in the Pietism of the next period.

(4) *The Fourth Period,* commonly known as the Pietistic and Moravian era, 'was a reaction against the dry scholasticism and cold formalism of the Lutheran Church,' and an emphatic pronouncement in favour of 'practical, personal, and experimental piety.' On the Lutheran side the leading writers were Spener, Francke, Richter, Freylinghausen, G. Arnold, J. Lange, Dessler, Rambach, Bogatzky, Schmolck, and Hiller; and on the Moravian, Count Zinzendorf. These names recall numerous hymns of deep spirituality, high refinement, and great power.

During this same period the German Reformed Church broke away from its long-continued and almost exclusive use of the Psalms in metrical form. Their first hymn-book appeared at Zurich in 1540. This was followed by A. Lobwasser's rhymed translation of the French Psalter of Marot and Beza in 1573. Another hundred and fifty years brought them into closer hymnological conformity with their Lutheran brethren, and produced amongst others three well-known hymn-writers, J. Neander, Lampe, and Tersteegen.

(5) *The Fifth Period* embraced about sixty years (1757-1817), and covers the time when the great wave of Rationalism broke in upon the German churches and for a time changed the whole aspect of their hymnody. Old hymns were altered or entirely rewritten, and new hymns written partaking of the nature of rhymed sermons on the existence of God, the immortality of the soul, the dignity of man, the obligations of moral duties, and kindred subjects. To the hymn-writers of this order there were a few notable exceptions, which included Gellert, Klopstock, J. C. Lavater, and M. Claudius, the greatest being Gellert and Klopstock.

(6) *The Sixth Period* is rich in writers. Beginning almost with the 19th century, it extends to the present time, and embraces the well-known names of F. von Hardenberg ('Novalis'), E. M. Arndt, F. A. Krummacher, F. W. Krummacher, A. Knapp, J. P. Lange, Spitta, and Gerok.

This digest of the hymnological work of more than a thousand years in one language can give only the slightest idea of what was done. Little or nothing has been said about the multitude of hymn-books (*Gesangbücher*) which were issued and brought into common use in the church and in the home, nor of the metrical versions of the Psalms, which have a history of their own. We can do no more than recall and emphasise the facts, and refer to special treatises for details. The influence of German hymns upon English and American hymnody has been very great. In fact, until the modern revival of translating hymns from the Latin and other languages, German was almost the only source from whence hymns other than English were taken for use in the hymn-books of Great Britain and America; and at the present time, especially in America, it holds a prominent position in the hymnals of almost every party and creed.

Did space permit, Dutch, Italian, Bohemian, Moravian, Scandinavian, and the hymns in use in foreign missions (in more than 150 languages and dialects) are each deserving separate notice.

*Conclusion.*—From the outset of the propagation of Christianity throughout the nations of the earth it became a necessity to preach to the people in their own languages, and gradually to supply them with hymns in their own tongues. This has resulted, as we have seen, not only in a great number of languages being represented in Christian hymnody, but also in a vast variety of metrical forms being found therein. Some of these forms are intimately associated with the ancient classical measures, whilst others are widely divergent therefrom, and seem to have had little or no laws of control beyond the fashion of the period or the fancy of the writers. With this broadening out of languages and forms came also a rapid increase in the number of subjects which engaged the attention of Christian poets. At an early stage of church history reverent strophes in praise of the Holy Trinity, and especially in adoration and praise of the Eternal
together with a metrical homily or two and
impassioned songs on the practical side of C
life, formed the staple of sacred song. We
how the expansion of church life and
ment of doctrine and practices called
and more extended hymnody, until e
importance in Bible story, every co
of Christian doctrine and ritual, ev
church's history, every experience i
life, from the sufferings of her lit
magnificent self-sacrifices of her ma
enshrined in sacred song.

**Hyōgō,** or KOBE, a port of c
situated on the west shore of the Gul
about 20 miles S. of that city. Po
80,446. The foreign settlement is finely laid
and the town is one of the most attractive a
prosperous in Japan. It has been open to foreign trade since 1860. Value in 1888 of exports, £2,593,804; of imports, £4,373,444—nearly double the returns for 1883. Hyogo has direct communication with Great Britain, Germany, Canada, and Australia; is noted for the excellent quality of its meat; has two foreign banks, wharves for ocean steamers, extensive shipbuilding-yards, and a large paper-mill.

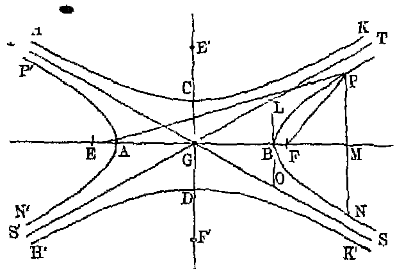
**Hyoid Bone,** in human anatomy, is a bony arch consisting of five movable parts, quite separate from the rest of the skeleton, and lying in the fleshy parts of the neck between the root of the tongue and the larynx (see TONGUE). For the hyoid bone of the dog, see the figure at DOG.

**Hyoscyamus.** See HENBANE.

**Hypatia,** daughter and pupil of Theon, an astronomer and mathematician of Alexandria, was born in the later part of the 4th century A.D. Her learning and wisdom made her the most influential teacher in Alexandria, and the fame of her lectures drew round her students from all parts of the East where the influence of Greek thought and knowledge was felt. The philosophy she taught seems to have been an eclecticism, the results of an endeavour to combine Neoplatonism with Aristotelianism; but her thoughts were principally given to astronomy and mechanics. Personally she was held in such great esteem, and such reliance was placed on her judgment and sagacity, that the magistrates used frequently to consult her on important cases. At this time the Bishop of Alexandria was Cyril (q.v.), a fierce hater of heathens and heretics. With his connivance, if not at his instigation, certain savage monks from the Nitrian deserts, headed by one Peter, a reader, attacked Hypatia in the streets as she was returning from her lecture-room, dragged her from her chariot, hurried her to the Cæsareum (then a church), there stripped her naked, and hacked her to death with oyster shells, after which she was torn to pieces, and her limbs carried to a place called Cinaron, and there burned to ashes (415). None of her writings have survived. Kingsley's romance, *Hypatia*, appeared in 1853.

**Hyperæsthesia** (Gr. *hyper*, 'over,' *aisthēsis*, 'a sensation'), in the most general sense of the word, denotes an excessive excitability of the parts of the nervous apparatus which have to do with sensation, special or common. Abnormal sensibility to pain is, however, more correctly called *hyperalgesia*. In this condition, as in Tic-douloureux (q.v.), the slightest stimulus may cause a paroxysm of pain, even a current of air or a noise bringing on an attack; while in hyperæsthesia of the special senses bright flashes of light may be seen, sounds may be heard, and even smells and tastes experienced in the absence of any objective cause. Of the diseases predisposing to hyperæsthesia hysteria is far the most frequent; but it is sometimes induced by rheumatism, gout, skin diseases, in[illegible]atory affections of the central nervous system, [illegible] it often adds greatly to the distress in the [illegible]es of various fevers. The treatment of [illegible]ia is that of the morbid change on [illegible]ends, but the local application of [illegible] or warm poultices, and sometimes [illegible]tricity may do much to diminish the [illegible]ings for the time.

[illegible] If two similar cones be placed [illegible] and with the lines joining the apex [illegible] base in each, in a straight line; [illegible]ane which does not pass through the [illegible] made to cut both cones, each of the [illegible]ions will be a *hyperbola*, as PBN, P'AN'.



It is, viewed analytically, the locus of the point to which the straight lines EP, FP differing by a constant quantity are drawn from two given points, E and F. These given points are called the *foci*, one being situated in each hyperbola. The point G, midway between the two foci, is called the *centre*, and the line EF the *transverse axis* of the hyperbola. A line through G perpendicular to the transverse axis is called the *conjugate axis*; and a circle described from centre B, with a radius equal to FG, will cut the conjugate axis in C and D. If G be taken for the origin of co-ordinates, and EM and E'F' for the axes, the hyperbola is expressed by the equation $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$. (GB = $a$, GC = $b$). The hyperbola is the only conic section which has Asymptotes (q.v.); in the figure these are GT, GT', GS, GS'. It also appears that, if the axes of co-ordinates be turned at right angles to their former position, two additional curves, HCK, H'DK', will be formed, whose equation is $\frac{x^2}{b^2} - \frac{y^2}{a^2} = 1$. These two are called *conjugate hyperbolas*, and have the same asymptotes as the original hyperbolas. These asymptotes have the following remarkable property: If (starting from G) the asymptotes be divided in continued proportion, and from the points of section lines be drawn parallel to the other asymptote, the areas contained by two adjacent parallels and the corresponding parts of the asymptote and curve are equal; also, lines drawn from the centre to two adjacent points of section of the curve enclose equal areas. The equation to the hyperbola when referred to the asymptotes is $xy = ab$; which shows that as the ordinates decrease in geometrical progression the abscissæ increase in the same ratio.

**Hyperbore'ans** (i.e. dwellers beyond Boreas or the North Wind), a name given by the ancients to a mythical people, whose land was generally supposed to lie in the extreme northern parts of the world. As the favourites of Apollo they enjoyed an earthly paradise, a bright sky, a perpetual spring, a fruitful land, unbroken peace, and everlasting youth and health. In the modern science of anthropology the term Hyperboreans is sometimes used to designate certain peoples, such as the Tchuktchis, Aino, Kamchadales, &c., who dwell in the north-east of Asia and the north-west and north of North America, and who cannot be classed either with the Indians or the peoples of the Asiatic plateau.

**Hypericaceæ,** or HYPERICINÆ, a natural order of about 300 known species, trees, shrubs, and herbaceous plants, widely distributed over the world, and in very different climates, but particularly numerous in North America. The species of Vismia yield a substance resembling gamboge. Many of the Hypericaceæ belong to the genus Hypericum, or St John's Wort (q.v.).

**Hyperi'des** (more correctly Hypereides), the Greek orator who, on the whole, ranks next to Demosthenes, excelling him in grace though inferior to him in moral power, was probably born about the same time as Demosthenes. By birth belonging to the middle class, he became a professional advocate, and earned large sums of money, which he spent with a generous hand alike on his private (somewhat scandalous) pleasures and on patriotic purposes. His *eisangelia* against Philocrates assured his professional position and brought him on to the stage of politics, where he was destined to play a notable part (343 B.C.). From the first he was an opponent of the party which advocated peace with Philip, and a supporter of Demosthenes. The importance which attached to him as a politician at this time is shown by the fact that he was chosen by the Areopagus to represent the Athenian case before the Amphictyons in the dispute as to the control of the Delian temple. During all Demosthenes' manful struggles against Philip up to the fatal field of Chæronea, when, with the defeat of Athens, the political liberty of Greece practically came to an end and the supremacy of Macedonia was established, Hyperides was the trusty and valuable supporter of Demosthenes. Even after the death of Philip, and during the early portion of Alexander's career, the two orators continued to be faithful allies. Only when Demosthenes endeavoured to follow an impossible *via media* in the matter of Alexander's absconding minister, Harpalus, did Hyperides break with his former leader, and head that accusation of bribery against Demosthenes which not only resulted in the banishment of the great orator but committed Athens to the fruitless revolt against Macedon, known as the Lamian war. The leaders of this revolt were Leosthenes and Hyperides; the former perished in battle, the latter was put to death by Antipater (322 B.C.). It is remarkable that although Hyperides was admired and studied in Roman times, although his works were not only known to Photius in the 9th century but actually preserved in MS. in the King's Library at Buda until 1526, when Buda was taken by the Turks, it was not until 1847 that we had any specimens of Hyperides' oratory by which to judge for ourselves of his powers. In that year Mr A. C. Harris of Alexandria purchased a papyrus at Thebes containing portions of Hyperides' speech against Demosthenes and of his speech for Lycophron. At the same time Mr J. Arden was offered a papyrus, while he was travelling in Egypt, which turned out to belong to the same volume as that bought by Mr Harris, and to contain the remainder of the speech for Lycophron, and also the whole of the speech for Euxenippus. In 1856 another traveller, Mr Stobart, obtained from the same neighbourhood another papyrus containing the Funeral Oration of Hyperides. And in 1889 M. Eug. Revillout announced that the Louvre had on his proposition purchased a papyrus which contains fragments of the first speech against Athenogenes, and is much better calculated to give us an idea of the skill of Hyperides than anything acquired by England (*Revue des Études Grecques*, January–March 1889).

What most impresses one in reading Hyperides is his grace, next his indolence, and always his urbanity. His grace is nothing affected or assumed, nor is it useless ornament. Hyperides is a practical, not an epideictic orator, and means business. His grace is that of a man performing a feat well within his powers, and that not a despicable feat. At the same time he is indolent, apparently because there is really no need to exert himself. He will not take the trouble to pick and choose words; he makes the one that comes first—obsolete, obsolescent, proverbial, conversational, or what not—do his work. He will not turn his sentences over mentally again and again before uttering them, so that they may roll out smooth, polished, balanced, and finished: he will rather let them come out at their own length, and as they list—he can pull them up at any time with effect and without effort. He is always transparent, never monotonous as is Demosthenes; he is witty to a degree, refined in his raillery, and his irony is delightful. Above all he never in his keenest attacks passes the bounds of good taste, as does Demosthenes. Finally, it must be remembered that what we possess cannot give us an adequate idea of the oratorical powers of Hyperides; of the speeches against Demosthenes and for Lycophron we only possess fragments; the speech for Euxenippus is indeed complete, but is never even mentioned by ancient critics, and therefore cannot have been one of his best productions. And as to the speech against Athenogenes, the anonymous writer of the treatise on the Sublime praises it indeed, but praises it as a pretty little speech. The best account of Hyperides is that given by Blass in his great work, *Die Attische Beredsamkeit*, III. ii. 1–72. Churchill Babington's original edition of the Orations for Lycophron and for Euxenippus (Cambridge, 1853) will always be valuable. The most complete and the best text of Hyperides' works is that of Blass in the Teubner series. To the scholar H. Hager's *Quæstiones Hyperideæ* (Leip. 1870) is indispensable.

**Hyperion,** a Titan, son of Uranus and Ge, and father of Helios, Selene, and Eos. Homer and later poets apply the name as a patronymic for Helios himself. Hence the attribute of beauty has been connected with the name, as in Shakespeare's 'Hyperion to a satyr.'

**Hypersthene** (Gr. *hyper*, 'above,' *sthenos*, 'strength;' so called to distinguish it from Hornblende, q.v., with which it was formerly confounded), a rock-forming mineral which crystallises in orthorhombic forms. It is an anhydrous magnesian silicate, containing a large percentage (15–24) of ferrous oxide with very little alumina. It is generally dark green or raven-black in colour, but has a pearly or metallic lustre when fractured across the cleavage-planes. This is due to the presence of very numerous minute brown scales of some foreign substance, which are arranged in lines along these planes. This mineral occasionally occurs massive, like hornblende, as in the island of St Paul on the Labrador coast. It is met with also as an occasional constituent of some eruptive igneous rocks, as in certain andesites and porphyrites, and in plutonic rocks, such as gabbro.

**Hypersthenite,** a more or less coarsely crystalline igneous rock allied to Gabbro (q.v.). It is an aggregate of labradorite (felspar) and hypersthene, and is of plutonic origin.

**Hypertrophy** (Gr., 'over-nourishment') is the term applied in medicine to the enlargement of certain organs of the body. The best examples of this change are seen in the muscular system, where it may occur altogether independently of dise
The huge bosses of flesh that stand promi
forward in the arm of a blacksmith or of a
and in the leg of an opera-dancer, are
of hypertrophy where the general he
perfect. In double organs, such
lungs, if the organ on one side d
disease, the organ on the opp
found to enlarge and carry on
these cases hypertrophy is an eff
is at the same time a resource of
life. There are, however, cases in
trophy has a hurtful instead
effect, as, for example, hypertrop
gland, constituting the disease kno
bronchocele, hypertrophy of the
of the spleen, &c. The following a
to Paget, the conditions which give
hypertrophy: (1) The increased exercise of a
in its healthy function; (2) an increased accu
lation in the blood of the particular materials which a part appropriates in its nutrition or in secretion; (3) an increased afflux of healthy blood. In hypertrophy of the muscular tissue the first and third of these conditions are present. In hypertrophy of the fatty tissue, constituting obesity, there is an excess of fat or of its chief elements in the blood.

**Hyphasis.** See SUTLEJ.

**Hypnotism,** or PSYCHO-THERAPEUTICS. From 1784, when Mesmer at Paris claimed the power of curing all manner of disease by 'animal magnetism,' this subject has been more or less tabooed by the medical profession. The nature of hypnotism and methods of inducing it are discussed at ANIMAL MAGNETISM. It is only within the last few years that it has received the scientific investigation which it deserves; but hypnotism is now extensively used on the Continent in treating disease, and is slowly finding its way into practice in Britain. It is impossible to suppose that hypnotism will ever fulfil the sanguine expectations of many of its exponents, though it seems certain that it will render great aid as a therapeutic agent in treating some kinds of diseases. It is still necessary to write very guardedly upon the subject, as its action when used for the cure of disease is imperfectly understood; but that it is useful as a method of treatment is demonstrated by many cures which have been thoroughly investigated by the highest scientific men. Hypnotism is not any longer to be regarded as a mystery or as a superhuman gift, for its action can for the most part be explained by our present knowledge of physiology and psychology. The chief reason why hypnotism cannot be universally employed as a therapeutic agent is the fact that only a certain proportion of persons can be hypnotised. The proportion, however, of persons insusceptible to its power is much less than was at one time thought; and, when used therapeutically, somnambulism, the deepest stage of hypnotism, is not necessary. On the Continent it is found that about 80 per cent. of the inhabitants can be hypnotised.

Hypnosis may be used in two ways in relation to disease. In the first place, simple sleep is induced, and sleep when produced without the action of drugs is often of great importance, and of itself aids in treatment. Again, in many cases when the person is asleep, suggestions may be made to him which will abolish pain, and which in some diseases will bring about either the relief of symptoms or the cure of the disease. Every one knows that the mind influences the body, and that concentrated thought can bring about sensations in various localities. It is upon this knowledge that the hypnotist bases his practice. The patient being placed in a hypnotic sleep, his attention is directed to various parts of the body, y often the effect is increased through local tion by means of passes or rubbing. During sleep the patient is uninfluenced by gs, and therefore he is all the more tions, and no disturbing influences owers of concentration. By means neuralgic or rheumatic pains may emoved; headaches may often be ay some forms of dyspepsia, as well anifestations of hysteria and hypo- even functional paralysis. It is ypnotism is useful in dipsomania persons addicted to opium-eating ed tastes. At present it *cannot* pnotism is of use in any disease ic origin, although in such diseases mptoms, especially those of pain, may ed successfully. It is quite possible for s to be performed upon persons under the hypnotic influence without the slightest pain being felt by the patient; but as various other anæsthetics are more easily employed, it is only in a few cases where these are contra-indicated that hypnotism will be used in this connection.

For educational purposes it is held possible to impress a person in the hypnotic sleep with ideas which will modify his usual character. For instance, it seems possible in many cases to cure persons of bad habits, such as stealing, lying, or the excessive use of alcohol; and on the Continent attempts are being made to influence habitual criminals for good by means of hypnosis. Young children, defective in brain-power or constitutionally vicious, may be improved by careful hypnotic treatment. It is a mistake to suppose that hypnotism can only be used successfully in treating nervous or hysterical persons. Such people are often difficult to hypnotise, and there is always a danger of either increasing their troubles or in some cases of inducing insanity. Ordinary individuals, especially those who have learned to obey, are the subjects whom a hypnotist would prefer to treat. Children at school, soldiers and sailors, and officials of all ranks, are the classes from which the most brilliant successes have been obtained hitherto in treating disease. In many cases of insanity hypnotism may be used with advantage as a therapeutic agent, although its employment in these cases is not by any means easy. Persons suffering from hallucinations, it is said, have been cured, and those who suffer from the painful result of some grievous trouble have been restored by having the incident blotted out from their memory.

Although hypnotism has power for good when properly used by medical men, it is an exceedingly dangerous weapon in the hands of the unskilful or unscrupulous. All public exhibitions of hypnotism should be prohibited by law, as persons experimented upon have been rendered lunatics, or had their nervous systems severely damaged. Crimes have been committed by persons who have been hypnotised. Just as a person when hypnotised is rendered extremely impressionable, and therefore capable of receiving beneficial suggestions, so he is nearly as liable to receive suggestions for evil: and it is quite possible for him during the hypnotic sleep to be impressed with the belief that he is to commit some act after he has awakened from the sleep—an act he is safe to do, acting at the time as an automaton. No person can be hypnotised against his will, and it is absolutely impossible for a person to be hypnotised unless he has the idea of what is going to happen. In the words of Bernheim, it is a psychical and not a physical influence which brings about the condition. It is only persons whose will-power is weakened by fear, or by the idea of a supposed power which influences them in spite of themselves, who can be hypnotised without full consent on their part. It is, however, perfectly true that the oftener a person is hypnotised the more easily may he be subsequently affected.

See Bernheim, *Suggestive Therapeutics* (trans. by Herter, 1889); Björnström, *Hypnotism: its History and Present Development* (New York, 1889); Tuckey, 'Psycho-therapeutics,' *Edinburgh Medical Journal* (1889-90).

**Hypnum,** a genus of mosses belonging to the order Bryineæ. Archegonia and capsules are borne on special lateral branches. The sexual organs are formed in August and September, and the capsules take from ten months to a year to ripen. Many species are remarkable for their beauty, and are often used for decorative purposes. Their distribution is universal.

**Hypocaust,** a form of furnace used by the Romans for the purpose of heating baths and apartments. It was placed in a chamber beneath the floor, and the heated air and products of combustion were made to circulate round the walls and under the floor by means of hollow tubes or a hollow lining, and were also carried in pipes to other rooms. See BATHS.

**Hypochæris,** a genus of plants of the natural order Compositæ, sub-order Cichoraceæ, of which one species, *H. radicata*, or Long-rooted Cat's-ear, is extremely common in meadows and pastures in Britain. Its leaves spread on the ground, and resemble in form those of the dandelion, but rough; the stem is branched, the flowers not unlike those of the dandelion, but smaller. Cattle eat this plant readily, and its abundance is not deemed injurious to pasture or fodder.

**Hypochlorous Acid,** $HClO$, is the acid contained in bleaching powder. It can only be obtained as a dilute solution, as in the concentrated state it is very liable to decomposition. It is a powerful bleaching agent, and forms a series of salts, *hypochlorites*, which also possess bleaching properties. The chief of these are the hypochlorites of lime and soda. The lime salt is the important constituent of bleaching powder, while the soda salt is prepared commercially by passing chlorine into a solution of soda. For further information, see BLEACHING POWDER.—*Hypo,* in composition (Gr. 'under'), is used much like *sub-* from Latin. Hypochlorous acid has less oxygen than chlorous acid; hyposulphuric has less oxygen than sulphuric, but more than sulphurous acid. Hypophosphates are salts formed by hypophosphoric acid and a base.

**Hypochondri'asis** (so called from its supposed connection with the hypochondriac regions of the Abdomen, q.v.), a disease characterised by extreme increase of sensibility, palpitations, morbid feelings that simulate the greater part of diseases, exaggerated uneasiness and anxiety, chiefly in what concerns the health, &c. In extreme cases it becomes a species of melancholia. The disease is intimately connected with, if not caused by, disorder of the digestive functions. See INDIGESTION, INSANITY.

**Hypodermic Injection.** This method, first introduced by the late Dr Alexander Wood of Edinburgh, is an extremely valuable one in certain cases, though its applicability is limited. It consists in the injection of a solution of the substance to be given beneath the skin, by means of a fine hollow needle to which a small syringe is attached. The prick given by the needle is much less acutely felt by the patient if the needle be lubricated with carbolic oil or the like. Absorption from the subcutaneous tissue takes place speedily, and is not interfered with by vomiting, or other conditions of the stomach which may delay or prevent the entrance of the remedy into the system by that channel. The action of the drug is thus at once more rapid and more certain than when administered by the mouth; and a smaller dose is required. Only such substances as can be given in small bulk and in an unirritating condition are available. It is thus chiefly of use for the vegetable alkaloids, of which morphia is far the most often employed. It need hardly be said that it is to be used only by skilled hands. The same method is largely employed in experiments on the action of disease poisons in animals, and in Pasteur's treatment of hydrophobia.

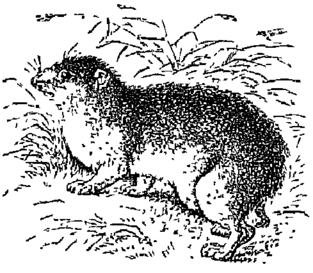
**Hypos'tasis,** the Greek term used to designate the distinct subsistence of the three persons of the Trinity (q.v.).

**Hypo'thec,** a term in the law of Scotland, but not used in England, to denote a lien or security over goods in respect of a debt due by the owner of the goods. Thus, a law-agent or attorney has a hypothec over the title-deeds of his client in respect of his account or bill of costs; and the landlord of agricultural subjects held under leases current at the 11th of November 1881 has a hypothec over the furniture or crops of his tenant for the current rent. The Hypothec Abolition (Scotland) Act, 1880, did away with the landlord's hypothec for the rent of all other land exceeding two acres let for agricultural purposes. See LANDLORD AND TENANT.

**Hypothenuse,** the name of that side in a right-angled triangle which is opposite to the right angle. The well-known property of the hypothenuse, that the square described on it is equal to the sum of the squares described on the other two sides, is proved in the 47th proposition of the first book of Euclid's *Elements.*

**Hyracotherium,** a genus of fossil ungulates, established in 1839 by Owen for a small Eocene animal about the size of a hare, to which, however, he afterwards gave the name of Pliolophus. See HORSE.

**Hyrax,** a genus of mammals representing a distinct order, the affinities of which are very obscure, and unilluminated by the discovery of any fossil forms. 'Feeble folk' as the species of hyrax (so-called 'cony') are, they find, according to many, their nearest allies in the huge elephants or in the ungulates proper. In size they are like rabbits; but the name 'cony,' which really belongs to the rabbit, is not very appropriate; in appearance they rather suggest marmots. They are natives of Africa and Syria, and live among the rocks, in stony deserts, or on trees. The plump body, thick head, small ears, short slender limbs, rudimentary tail, soft yellowish-gray or brownish fur are obvious external characteristics. Closer examination shows many peculiarities. The snout, which has a cleft upper lip, is somewhat rodent-like, and so are the rootless, persistently growing curved upper incisors, except that they have a prismatic shape and a sharp point instead of the chisel edge of rodents. The entire dentition is expressed



Hyrax syriacus.

in the formula $\frac{1\,0\,4\,3}{2\,0\,4\,3}$, and the back teeth are
pattern distinctly like those of the rhinocer
some other ungulates. There are four t
anterior limbs, three on the hind, all
broad nails except the inner toe of
which bears a curved claw. The
suggest those of rhinoceros or tap
esting in the further peculiarit
sole is furrowed in such a way t
in gecko-like fashion cling to th
rocks and trees. Among the m
of the skeleton may be noticed
(28–30) of back and loin (dorso-
The brain and skull most resemb
lates; the stomach recalls that o
ceros; the placenta is zonary as in c
carnivores.

There are numerous species, sometimes re
to two genera, Hyrax and Dendrohyrax.
former is represented by *H. capensis*, the Cap
Daman, Klippdass, or Rock-badger; *H. syriacus*, the Shaphan—mistranslated 'cony'—of Scripture; and *H. habesinicus*, the Ashtok of the Abyssinians. These live in companies, usually in holes among the rocks, and feed on shoots, grass, flowers, and the like. In reference to the Scripture account it may be noted that the hyrax does *not* chew the cud, though it moves its jaws very constantly. Though only two are born at a birth, the rate of multiplication is very rapid, keeping pace with ravages of carnivores, which are very deadly in spite of the caution and even sentinels of the hyraxes. Of different habitat, and sometimes referred to the second genus, Dendrohyrax, are certain hyraxes which, in West and South Africa, live in trees—e.g. *D. arboreus* and *D. dorsalis.* The members of this order, so puzzling zoologically, are playful, good-humoured, and wary.

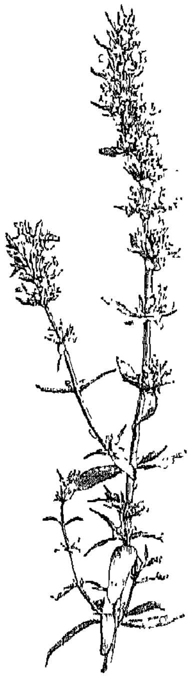
Their flesh is sometimes eaten, and is said to resemble rabbit's.—*Hyraceum*, a supposed medicine for certain nervous diseases, was made from the mixed urine and fæces of the Cape Hyrax.

**Hyrcania,** an ancient district of Asia, of indefinite extent, bordered on the Caspian Sea (sometimes called *Hyrcanum Mare*) and the river Oxus. It corresponded with the modern Mazanderán and Asterabad.

**Hyrcanus,** the name of two Jewish high-priests and princes of the Hasmonean family (see MACCABEES). (1) JOHN HYRCANUS, son of Simon Maccabæus, who ruled 135–105 B.C., was at first tributary to the Syrians, but on the death of Antiochus made himself independent, subdued the Samaritans on the north, and forced the Idumæans on the south to adopt the laws and customs of the Jews. He also concluded an alliance with the Romans, and extended his territories almost to the ancient limits of the Davidian monarchy. Originally a Pharisee, he subsequently attached himself to the party of the Sadducees, who were anxious to keep on good terms with the Romans, and who discountenanced the turbulent religious patriotism of the Jewish masses. Hyrcanus was, comparatively speaking, a just and enlightened ruler, and the country enjoyed great prosperity during his reign. He left five sons, two of whom, Aristobulus and Alexander, governed with the title of king.—(2) HYRCANUS II., son of Alexander, and grandson of the preceding, was a feeble prince. On the death of his father (78 B.C.) he was appointed high-priest by his mother Alexandra, who ruled Judæa herself for the next nine years. After her death (69 B.C.) his younger brother, Aristobulus, a braver and more energetic man, seized the government, and forced Hyrcanus to withdraw into private life. He failed to win back his dominions, until Pompey began to favour his cause. After some years of tumultuous fight- Aristobulus was poisoned by the partisans of ay (49 B.C.), and Hyrcanus for some time ed the dignity of high-priest. Cæsar (47 ount of the services rendered to him Idumæa, made the latter procurator thus left in his hands all the real ter was assassinated, and Anti- Aristobulus, with the help of the invaded the land, captured Hyr- s, cut off his ears, and carried ia on the Tigris. Some years of his old friend Antipater, power in Judæa, and invited s home to Jerusalem. He was and for some time lived in ease , falling under suspicion of intrigu- d, he was put to death, 30 B.C.

, JAMES, poet, was born in the parish of d, Dumfriesshire, July 23, 1798. While as a shepherd near Airdsmoss, Ayrshire, the of a Covenanting skirmish and Cameron's (1680), the traditions of the district stimu- his imagination to the writing of his best- wn poem, 'The Cameronian's Dream,' which appeared in the *Edinburgh Magazine* (1821). Hyslop, who had prepared himself by persevering private study for teaching at Greenock, through the influence of Lord Jeffrey was appointed tutor on board the *Doris*. While tutor on board the *Tweed* man-of-war he died of fever at St Jago, Cape Verd Islands, November 4, 1827. An edition of his poems was printed from his manuscript book by the Rev. P. Mearns, Coldstream (Glasg. 1887). Mr Hamish M'Cunn set his 'Cameronian's Dream' to music in 1889.

**Hyssop** (*Hyssopus*), a genus of plants of the natural order Labiatæ, distinguished by four straight diverging stamens, and a calyx with fifteen ribs. The known species are few. The Common Hyssop (*H. officinalis*) is a native of the south of Europe and the East. It is found on the Alps of Austria. It is a half-shrubby plant, about 1½ feet high, the upper part of the stems quadrangular, the leaves evergreen and lanceolate, the flowers in one-sided whorled racemes. The flowers are generally of a very beautiful blue. It has an agreeable aromatic odour. It has long been in cultivation for the sake of its leaves and young shoots, which are sometimes used for culinary purposes as a seasoning, but more generally in a dried state as a stomachic and carminative. A syrup made with them is a popular remedy for colds. The virtues of hyssop depend on a volatile oil.—The hyssop of the Bible has been supposed to be some species of Phytolacca (q.v.), as *P. acinosa*, a native of the Himalaya; but on the authority of Dr Royle it appears to have been the common Caper (q.v.).—Hedge Hyssop is *Gratiola officinalis*. See GRATIOLA.



Common Hyssop (*Hyssopus officinalis*).

**Hysteria** (Gr. *hystera*, 'the womb') derives its name from an ancient but erroneous notion that it is specially connected with disorders of the womb. It is a disease which exhibits itself under so many aspects that to describe all the varied forms which it may assume would be to give an epitome of the symptoms of nervous diseases in general, for there is hardly one of these which the mimicry of hysteria may not reproduce. In dealing with the condition two things must be kept in mind—the tendency or temperament which predisposes to it, and the exciting cause which determines the actual attack. Among savages it is scarcely ever met with. Among civilised races it is unequally distributed, the French, for example, being more hysterical than the English, while in every country the female sex, especially at or before the age of puberty, is far more liable to it than the male. Among boys, however, it is not uncommon. The tendency seems sometimes to be due to hereditary influence, sometimes to injudicious training in childhood.

The exciting cause which develops the hysterical tendency into actual hysteria is generally some severe emotional shock—a fright, an unhappy love affair, or a sudden reverse of fortune. But many general diseases occasionally carry hysteria in their train; and in 1880 a volume of nearly 400 pages appeared (*The Exciting Causes of Hysteria*, by Georges Guinon) dealing solely with the enumeration and discussion of the exciting causes of this Protean malady.

In the developed disease some of the symptoms are continuous, others occasional or paroxysmal. The will is weakened, and the patient is a prey to unregulated whims and impulses. The temper is often irritable, and every petty annoyance is exaggerated into a serious trouble. There is a morbid craving for sympathy, which leads to the most outrageous acts. Blood has been swallowed by a hysterical girl in order that she might vomit it again. Porter has been mixed with urine, and the mixture palmed off upon the medical man as an abnormal discharge. The most elaborate lies have been concocted; innocent people have been accused of imaginary crimes; every inconvenience has been suffered and every artifice exhausted in order to play upon the credulity or the pity of friends and attendants.

This moral perversion has its counterpart in the disorder of the sensory and motor mechanism. Sensibility to impressions of various kinds may be exalted, lessened, or abolished. A touch may give rise to all the symptoms of severe pain; and, on the other hand, the prick of a pin, or even the contact of a hot iron, may not be felt. Paralysis of the legs, arms, or face, or of one side of the body, or of special muscles or groups of muscles, is a very common symptom. Laryngeal paralysis may reduce the voice to a whisper. Speech or motor power may often return suddenly, especially under the influence of strong emotion; and there is no doubt that 'miraculous' cures are sometimes of this nature. A hysterical paralytic, for instance, will generally run out of a burning house. Digestive disorders are common in hysteria, and, aided sometimes by fraud, give rise to 'fasting girls' and other newspaper marvels. Palpitation, great rapidity of breathing, giddiness, and flushing of the face are also of frequent occurrence.

But besides these more or less continuous symptoms, there are the occasional paroxysms or 'fits' which in the popular mind are chiefly associated with the name of hysteria. These emotional storms or crises vary much in frequency and severity. In the mildest form there is no loss of consciousness, but the arms, legs, and head are tossed about, and there is great mental excitement. In severer cases, perhaps after some premonitory symptoms, such as the sense of constriction in the throat known as the *globus hystericus*, the patient falls to the ground, sometimes with a scream, her features twitching, her back arched, and her legs and arms moving convulsively. She may snap like a dog at the hands of those who approach her, or at her own, occasionally inflicting serious injuries; but she rarely hurts herself in falling, as often happens in an epileptic fit. The seizure may last only a fraction of a minute, or as long as three or four hours.

The treatment of hysteria must be directed both to the removal or alleviation of the symptoms and to the cure of the condition which gives rise to them. The first object can generally be attained, the second more rarely. The treatment must be both moral and physical, and the former is the more important of the two. In the more severe cases complete change of scene and surroundings is required. The patient should be placed among strangers, and away from the sympathising friends whose well-meant 'coddling' and condolence are often the chief hindrances to recovery. The nurse must be kind but firm; and while the morbid tendencies of the patient are repressed, she must not be laughed at but understood, and encouraged to make essays in self-control. As an alternative to sending the patient away from home, the Weir-Mitchell treatment has met with much success. The patient is kept in bed, isolated except from the attendant, and fed with abundance of easily-digested food, electricity and massage being applied daily.

Particular symptoms must be treated on general principles. Forced feeding by means of a stomach-tube may be required if the appetite is gone or the patient refuses food. A mixture of milk, eggs, meat, and the flour of lentils has been used for this purpose with success. Of late hypnotism has been much employed in France for the treatment of hysterical affections; but this is a method which should be used with caution, for it sometimes aggravates the condition which it is intended to cure.

For prevention of the 'fits' the most useful drugs are valerianate of zinc, iron, morphia, and turpentine. Slight attacks may be warded off by an antispasmodic like ether, or by inhaling nitrite of amyl. To cut short an attack after it has begun a copious douche of cold water to the head is an old and approved plan. A still more effectual proceeding is to close the mouth and nose with a towel for fifteen or twenty seconds. A little cold water poured into the mouth often acts at once. When everything else fails, $\frac{1}{12}$th to $\frac{1}{16}$th of a grain of apomorphine, injected under the skin, will end the fit (Gowers).

People with a tendency to hysteria should be encouraged to substitute some rational and regular work for the aimless life of alternate excitement and lassitude which so many of the women of the upper and middle classes lead.

**Hystrix.** See PORCUPINE.

**Hythe,** a parliamentary and municipal borough and market-town of Kent, 5 miles WSW. of Folkestone, 15 miles S. of Canterbury, and 67 SE. by E. of London by rail, is one of the Cinque Ports (q.v.), although in actual locality Lympne or Lymm (the ancient *Portus Lemanis* of the Romans), now some three miles inland, was probably the original harbour. The town, which is pleasantly situated some distance from the sea, is built on the side of a hill, from the top of which an extensive view over the Romney marsh is obtained. Its church, a cruciform building of great beauty, in part Romanesque, has
restored since 1866, and contains in a cryp
neath the chancel an extraordinary col
human skulls and bones—many o
having deep cuts in them—the age
which are altogether uncertain.
are the headquarters of the Sch
and Shorncliffe camp, both esta
the picturesque ruins of Saltwo
memories of Becket; and the Roya
23 miles in length, constructed in
veyance of military stores to Ry
much use, and now entirely sup
railway. In 1881 a sea-wall and para
from Hythe to Sandgate (q.v.) an
(q.v.), was opened. These and some s
are included in the parliamentary boroug
Hythe, which since 1832 has returned only
member. Pop. of that borough (1851) 13,16
(1881) 28,239, of whom 4173 were within the mun
cipal limits, which include West Hythe.—In 1295 the French made a descent on Hythe, but were decisively repulsed, and later on, towards the end of the reign of Richard II., the town was visited with a threefold calamity, a fire having destroyed 200 houses, a pestilence carried off numerous inhabitants, and an unusually heavy storm caused a severe loss of men and ships. Several charters are preserved at Hythe, amongst them its earliest charter of incorporation granted in 1575. See Montagu Burrow's *Cinque Ports* (1888).

# I

**I** the ninth letter in the alphabets of western Europe, was called *iota* by the Greeks, from its Semitic name *yod*. Hence, owing to the character being the smallest in the Hebrew alphabet, we get the word *jot*, 'a tittle' (St Matt. v. 18), and *jottings*, or 'small notes.' The name *yod* meant a hand, the form of the character in the Egyptian Hieratic, from which the Phœnician alphabet was derived, bearing some resemblance to a hand, with the thumb held apart from the fingers (see ALPHABET). In early Greek inscriptions the form of the letter was angular, something like our Z; it then came to resemble S, and this, about the 7th century B.C., was straightened out into a vertical stroke. It has since varied less in form than any other letter. The dot in our minuscule *i* first came into use in the 11th century A.D. It was originally an accent, *í*, and was only employed to distinguish *ii* from *u*, or to mark the *i* in the combinations *ui* and *iu*. In the 12th century the accent began also to be used when *i* was in juxtaposition with *m* or *n*. It only became universal after the invention of printing, when it was found inconvenient to use two forms of type. In the 14th century a dot began to be substituted for the accent, the oldest MS. in which the dot is found dating from 1327. These distinctions may
rivial, but are very useful in determining the
dieval MSS.

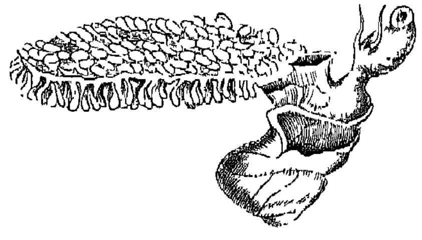
and in most European languages, the
tter is that of the Latin long *i*, the
r *e*, which we have in the English
d *marine*. The long *ī* in Latin
pronounced, and never like *i* in
ound of our *i*, which is really a
heard in words where it is sup-
ipt *e*, as in *bite*, *pipe*, *mine*, or
l by an old guttural, as in *high*,
became the name-sound because
S. *ic*, Ger. *ich*) was originally
ttural which has now fallen out.
d of *i* in English is that heard in
ch is the short Latin *i*. This sound
d by *y* in *cymbal*, by *u* in *busy*, by *o* in
*ei* in *forfeit*, by *ie* in *sieve*, by *ui* in *guilt*,
*breeches*, and by *ia* in *carriage*. See J.

**o.** See JAMES, and SANTIAGO.

**mbic Verse,** a term applied, in classic
ody, and sometimes in English, to verses con-
ing of the foot or metre called *Iambus*, consist-
of two syllables, of which the first is short, and
e second long ( ⏑ –). Archilochus (q.v.) is the
eputed inventor of iambic verse. The English language runs more easily and naturally in this metre than in any other. Thus, our usual blank-verse line consists of five iambuses, while we have also such combinations of continuous rhyming metres in iambic measure as tetrasyllabics; lines of six syllables and three accents (Skeltonical verse); octosyllabics, as in most of the old romances, *Hudibras*, *Lalla Rookh*, and most of Scott's and Byron's romantic poems, except *Lara* and the *Corsair*; decasyllabics, with five accents, which when rhyming in couplets forms our so-called heroic metre; and Alexandrines, or twelve-syllable metre with six accents, as in Drayton's *Polyolbion*. See METRE.

**Iamblichus,** a Neoplatonist philosopher, a native of Chalcis, in Cœle-Syria, who died about 330 A.D. He was a pupil of Porphyry, and follower of Plotinus; but in his hands the Neoplatonist philosophy degenerated into theurgy and demonology, while among his disciples his reputation spread as a conjuror and miracle-worker. His writings included a life of Pythagoras, and treatises on mathematics and philosophy; the authenticity of the treatise on Egyptian mysteries (ed. Parthey, 1857) is more than dubious. See NEOPLATONISM.

**Ianthi'na,** a genus of gregarious, pelagic gasteropods, in the same division as the river snail (Paludina), Trochus, Turbo, &c. The shell is snail-like, but delicate, translucent, and blue in colour. In the warmer seas the animal floats by expanding its 'foot' on the surface, and is drifted about by currents, occasionally on to British shores. It is most remarkable for an airy raft which it secretes, and eventually sets adrift, laden with egg-capsules, like those of the whelk. The animals exude a violet secretion, and seem to feed on Velella and other Cœlenterates of the Portuguese man-of-war type.



Common 'Violet Snail' (*Ianthina fragilis*): Shell, animal, and raft.

**Iapygia.** See APULIA.

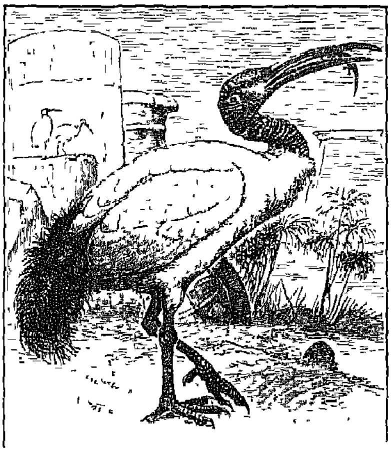
**Ibarra,** capital of Imbabura province, Ecuador, has some manufactures of wool and cotton, and a pop. of about 10,000.

**Iberia,** the name by which Georgia (q.v.) was known to the Greeks and Romans; and also an ancient name for Spain. The question of an Iberian race is discussed at BASQUES, Vol. I. p. 781.

**Iberis.** See CANDYTUFT.

**Ibex,** a name given to several species of the genus Capra, of which the best known is the Alpine Ibex (Ger. *Steinbock*, Fr. *Bouquetin*). The various species are described at GOAT.

**Ibis,** a genus of birds related to the Spoonbills, and, more remotely, to the Storks and Herons. It comprises about twenty-five species, of which the bulk belong to the Old World, though the genus is nearly cosmopolitan. The bill is long, slender, curved, thick at the base, the point rather obtuse, the upper mandible deeply grooved throughout its length. The face, and generally the greater part of the head, and sometimes even the neck, are destitute of feathers, at least in adult birds. The plumage is mainly white, with black primary feathers and plumes on the wings. The neck is long. The legs are rather long, naked above the tarsal joint, with three partially united toes in front, and one behind; the wings are moderately long; the tail is very short. The Sacred Ibis, or Egyptian Ibis (*I. æthiopica*; formerly known as *I. religiosa*), is an African bird, 2 feet 6 inches in length, although the body is little larger than that of a common fowl. The Glossy Ibis (*I.* or *Plegadis falcinellus*) is a smaller species, also African, but migrating northwards into continental Europe, and occasionally seen in Britain. It is also a North American bird. Its habits resemble those of the sacred ibis. Its colour is black, varied with reddish-brown, and exhibiting fine purple and green reflections. It has no loose pendent feathers. The White Ibis (*I.* or *Eudocimus alba*), a species with pure white plumage, abounds on the coasts of Florida. The Scarlet Ibis (*I.* or *Eudocimus ruber*) is a tropical American species, remarkable for its brilliant plumage, which is scarlet, with a few patches of glossy black. The Straw-necked Ibis (*I.* or *Carphibis spinicollis*) is a large Australian bird of fine plumage, remarkable for stiff naked yellow feather-shafts on the neck and throat.



The Sacred Ibis (*Ibis æthiopica*).

The Sacred Ibis, one of the birds worshipped by the ancient Egyptians, and called by them *Hab* or *Hib*, was supposed, from the colour of its feathers, to symbolise the light and shade of the moon. It was the avatar of the god Thoth or Hermes, who escaped in that shape the pursuit of Typhon. Its feathers were supposed to scare, and even kill, the crocodile. It appeared in Egypt at the rise and disappeared at the inundation of the Nile, and was said to deliver Egypt from the winged and other serpents which came from Arabia. As it did not make its nest in Egypt it was believed to be self-engendering, and to lay eggs for a lunar month. It was celebrated for its purity, and only drank from the purest water; besides which, it was fabled to entertain the most invincible love of Egypt, and to die of self-starvation if transported elsewhere. Its flesh was thought to be incorruptible after death, and to kill it was punishable with death. Ibises were kept in the temples, and unmolested in the neighbourhood of cities. After death they were mummied, and there is no animal of which so many remains have been found at Thebes, Memphis, and some other places. They were prepared as other mummies, and wrapped up in linen bandages, which are sometimes plaited in patterns externally. See Wilkinson, *Manners and Customs*; and Renouf's *Hibbert Lectures* (1880).

**Iblis.** See DEMONOLOGY.

**Ibn Batuta,** Arab traveller and geographer, whose proper name was Abu Abdullah Mohammed, was born at Tangiers in 1304, and spent thirty years (1325–54) of his life in travel. Settling at Fez, in Morocco, in 1354, he wrote the history of his journeys, and died there in 1378. The course of his travels led him first to Mecca, then to Persia, Mesopotamia, Arabia, the east coast of Africa, Asia Minor, the Caspian regions, Khwarizm, Bokhara, Afghanistan, and India; thence he proceeded to China by way of Sumatra, and finally came home to Fez in 1349. But his journeys were not yet done. He visited southern Spain, and then travelled as far as Timbuktu on the Niger. His narrative is extremely interesting, humour and anecdote alternating with graphic description, and through it all runs the golden thread of the writer's naïve personality. It was published with a French translation, in 4 vols., by Defrémery and Sanguinetti in 1858–59. See *National Review*, July 1888, and *Scottish Geog. Mag.*, September 1888.

**Ibn Gabirol.** See AVICEBRON.

**Ibn Zoar.** See AVENZOAR.

**Ibrahim Pasha,** viceroy of Egypt (1789–1848). See EGYPT, Vol. IV. p. 242.

**Ibrail.** See BRAILA.

**Ibsen,** HENRIK, poet and the creator of a new type of drama, was born at Skein in south Norway, 20th March 1828. In 1842 he was apprenticed to a chemist at Grimstad. But he aimed higher: he studied, and wrote poetry and a drama, *Catilina*. This, published in 1850, was a failure. In the same year he became a student at Christiania University, but soon grew tired of academic study. After nearly two years of journalistic work he was
appointed director of Ole Bull's theatre at
For it he wrote five romantic dramas, but
—*Lady Inger at Ostråt* and *The Banquet*
—have been published. In 1857
similar duties for the National Th
tiania. His next dramas were
*Helgeland* (1858), *The Rival*
*Love's Comedy* (1862). The fi
reproduce the style and spirit of
placed Ibsen in the first rank
dramatists. The last is a precur
social dramas; it set all the
Norway against him. Then in
Theatre became bankrupt; and,
was bitterly disappointed when
from the Danes in their struggle agai
powers. So, thoroughly disgusted wi
men and his country, he said good-by
on 2d April 1864, and has ever since live
chiefly in Rome, Dresden, and Munich. Th
wegian parliament granted him—reluctant
pension in 1866. In that and the following
appeared the lyric dramas *Brand* and *Peer Gynt*,
many respects the finest things he has done;
poetic workmanship is of a very high order. Bra
is an incarnation of the absolute sense of duty,
his ideal striving and self-sacrifice end in disast
because he is ignorant of the proper function of love. Peer Gynt is the complete mirror of actual man; in his case selfishness and romantic fancy are the rocks upon which ideal striving comes to nought. By intention peculiarly representative of Norwegian character, both dramas have also a universal validity. In 1873 Ibsen published the double drama *Emperor and Galilean* (Julian and Christ; Eng. trans. 1876), in which he foretells the 'third kingdom' that is to transcend both classic and Christian culture. But already in 1869

he had finished *The Young Men's League*, another of the satirical social dramas which have made his name famous. This has been followed by seven others—*Pillars of Society* (1877), *A Doll's Home* (1879), *Ghosts* (1881), *An Enemy of the People* (1882), *The Wild Duck* (1884), *Rosmersholm* (1886), and *The Lady from the Sea* (1888). In his lyric and epic *Digte* (2d ed. 1875) every piece is excellent.

These plays aroused a storm of controversy in England in 1889, as they had done shortly before in Germany and in the Scandinavian countries. Ibsen is a passionate advocate of individual liberty. He maintains that man's first and chiefest duty is to be wholly man, consistent with himself in all things. An idealist of the highest type in the beliefs he entertains as to the future possibilities of mankind, he is a sceptic in his estimation of existing men, and especially of existing institutions, social and political. His mission, like Socrates' of old, is to awaken men to a real comprehension of themselves. Thus he is an uncompromising moral reformer. He is inspired by a stern Semitic earnestness, and drives right through all obstacles to get grasp of truth unmistakable. The interest and method of his plays are almost exclusively psychological. He makes the consequential development of character the supreme law of dramatic evolution. His plays represent the conclusion from the psychological premises of some problem in character or social circumstance. Each play begins where an ordinary play would be just on the point of ending; the situation is completely formed before the curtain rises. By his analytic method Ibsen is enabled to paint richly-detailed pictures of inner soul-life without resorting to long monologues or explanatory speeches. His language is concise and vigorous, and full of vivid realism. He gets some of his effects by the use of incisive sarcasm and tragic irony and fearless outspoken realism; but the whole is controlled by the sternest artistic restraint. His characters
persons: each in thought, language, and
presents a consistent individuality
Ibsen's chief faults are a leaning to
elic of his romantic days), and a
gerate contradictions of character,
action with motives, and to use
s.

asenius (in Swedish, 1883), Passarge
Jæger (in Norwegian, 1888), and
*Moderne Gjennembruds Mænd* (in
nglish read Mr Gosse's papers in
1873 and 1889), Mr Symons's in
il 1889), and Mr Wicksteed's study
*temporary Review* (August 1889).
edited Eng. trans. of Ibsen's prose

ek lyric poet, a native of Rhegium,
shed about 540 B.C., and lived some
court of Polycrates, tyrant of Samos.
o the legend he was slain by robbers
nth, and dying called upon a flock of
es that he saw flying overhead to avenge him.
e cranes went and hovered over the theatre at
rinth, where the people were assembled. One
the murderers, seeing them, exclaimed involuntarily, 'Behold the avengers of Ibycus.' This led to an inquiry, and to the conviction of the guilty. The story is best told in Schiller's beautiful ballad. Ibycus wrote chiefly erotic poetry. The fragments that survive are printed in Bergk's *Poetæ Lyrici Græci* (vol. iii.), and in Schneidewin's *Delectus*

Ica, 50 miles SE. of Pisco, its port, with which it is connected by railway. Pop. 7000.

**I'carus.** See DÆDALUS.

**Ice** is water in the solid form. It is specifically lighter than water which is just about to freeze, and therefore swims in it. Water, in becoming solid, expands about $\frac{1}{11}$th in volume or bulk, and thus acquires a density equal to 0·91674 (water at 0° C. = 1·00). The formation of ice takes place generally at the surface of water. This is owing to the peculiarity that, when water has (at the ordinary atmospheric pressure) cooled down to within 3·9° C. of freezing, it ceases to contract as it did before with increase of cold, and begins to expand until it freezes (see HEAT); this causes the coldest portions of the water to be floating always on the surface. In some circumstances, not very well explained, ice forms at the bottom of rivers, and is called ground-ice or Anchor-ice (q.v.).

Water in ordinary cases freezes at the degree of temperature marked 0° on the Centigrade and Réaumur's thermometers and 32° on Fahrenheit's; but if it is kept perfectly still it may be cooled to nearly − 5·5° C. below freezing (= 22° F.) and still remain liquid. The least shake, however, or throwing in of a solid body, makes a portion of it freeze instantly, and its temperature rises immediately to 0° C. Sea-water, and salt water in general, freezes at a lower temperature than pure water; in doing this part of the salt separates, and the ice, when melted, gives water that is fresher than that on which the ice was formed. The colour of pure ice is deep blue, which is only discernible, however, when it is in large masses; it is best seen in the clefts of a glacier or of an iceberg. In order to melt a pound of ice it is necessary to communicate to it as much heat as will raise 80·025 lb. of water 1° C. This measures the 'latent heat' of ice; the temperature does not rise until the ice has been melted.

In the neighbourhood of the poles, and on mountains of a certain height in all latitudes, there exist immense masses of permanent ice; and even in some districts of Siberia, where a kind of culture is practicable in summer, there are found, at a certain depth below the surface of the earth, strata of ice mingled with sand. In sinking a well at Yakutsk, the soil was found permanently frozen hard to the depth of 382 feet, and consisting in some parts entirely of ice. In the lower regions of the torrid zone there is no ice, and in the temperate zones it is a passing phenomenon. From the polar ice-fields and glaciers which are always protruding themselves into the sea, great floating masses become detached and form *icebergs*, floes, and drift-ice (see GLACIER). These bergs or

An Iceberg.

berg below the water is about nine times that of the protruding part. Icebergs, and floes or ice-fields, are often laden with pieces of rock and masses of stones and detritus, which they have brought with them from the coasts where they were formed, and which they often transport to a great distance towards the equator. These floating masses of ice are dangerous to navigation. The *ice-foot* is the belt or fringe of ice along the shores in arctic regions.

The hardness and strength of ice increases with the degree of cold. In the severe winter of 1740 a house was built of the ice of the Neva at St Petersburg, 50 feet long, 16 wide, and 20 high, and the walls supported the roof, which was also of ice, without the least injury. Before it stood two ice-mortars and six ice-cannon, made on the turning-lathe, with carriages and wheels also of ice. The cannon were of the calibre of 6-pounders; the thickness of the ice was only four inches, and yet it resisted the explosion.

Faraday first called attention to a remarkable property of ice, since called Regelation. Two slabs of ice, with flat surfaces, placed in contact, unite into one mass even though the temperature of the surrounding air be considerably *above* the freezing-point. Faraday endeavoured to account for this by assuming that a small quantity of water, surrounded on every side by ice, has a natural tendency to become ice; and the fact that two blocks of ice placed in contact do not unite unless they are *moist* seemed to bear out this idea. But J. Thomson gave a totally different explanation of this phenomenon. He showed that the capillary force in the film of water between the plates is sufficient to account for a very considerable pressure between them; so that from his point of view the phenomenon would be identical with the making of snowballs by pressure, or with the formation, by a hydraulic press, of clear blocks from a mass of pounded ice, an observed fact, the explanation of which is to be found in the property of ice mentioned below. Faraday, taking up the question again, showed that the (so-called) regelation takes place in *water* as readily as in air, a fact quite inconsistent with the action of capillary forces. To this J. Thomson replied, showing, very ingeniously, that the capillary forces he at first assumed are not necessary to a complete explanation of the observed phenomena. See *Proceedings of the Royal Society*, 1860–61.

Other views of the question are numerous: for instance, that of Persoz, adopted by Forbes, in which ice was considered as essentially colder than water, and as passing through a sort of viscous state before liquefying, as metals do during the process of melting. This idea, however, has not of late found much support; and it is possible that the true solution of the question is, as J. Thomson pointed out, to be found in the analogy of the crystallisation of salts from their aqueous solutions.

However that may be, there is no doubt about the following property of ice, theoretically predicted by J. Thomson from the experimental fact of its expanding in the act of freezing, and demonstrated by means of the Piezometer by Sir W. Thomson—viz. that the freezing-point of water, or the melting-point of ice, is *lowered by pressure* to the extent of 0·0074° C. for every atmosphere of pressure; and the brothers have, with singular ingenuity, applied this to the explanation of the motion of glaciers. That a mass of glacier-ice moves in its channel like stress than others. The pressure to which they are subjected is such as corresponds to a melting-point considerably *below* the temperature of the mass—and therefore, at such points, if the ice be not altogether too cold it melts, the stress is relieved, and the whole mass is free for an instant to move nearly as a fluid would move in its place. But, the stresses being thus for an instant removed, the temperature and pressure of the water are again consistent with freezing—the thin layer of water quickly solidifies, and then matters proceed as before. Thus, at every instant, the stresses at different parts of the mass melt it at those places where they are greatest, and so produce the extraordinary phenomenon of a mass which might in common language be termed *solid*, and even *rigid*, slowly creeping down its rocky bed like a stream of tar or treacle. This explanation would not meet the case of extremely cold ice; and it appears that even extremely cold ice can be made to flow slowly; whence ice must have some true viscosity.

*Ice-trade and Manufacture.*—The trade in ice is now one of great and increasing importance. Ice has always been esteemed as a luxury in warm weather; and this early led to the storing of it in winter and preserving it for summer use. The Greeks, and afterwards the Romans, at first preserved *snow*, closely packed in deep underground cellars. Nero, at a later period, established ice-houses in Rome, similar to those in use in most European countries up to the present time. But these means were not enough to supply the luxurious Romans with ice for cooling beverages, and they actually established a trade in snow, which was brought to Rome from the summits of distant mountains. The trade in ice in Great Britain was, until a recent period, a very limited one, having been chiefly confined to the supply required by a few of the first-class fishmongers and confectioners—the private residences of the more opulent families being furnished with ice-houses (generally solid built cellars, wholly or partially underground), [illegible] which a sufficiency is kept for private use. [illegible] ice has come to be more and more larg [illegible] in preserving provisions, both in ref [illegible] chambers and otherwise. It is al [illegible] brewers. In surgical operations i [illegible] produce partial anæsthesia; it ser [illegible] cool the mouth and reduce the in [illegible] ture, while ice in bags, applied t [illegible] found helpful in many cases of s [illegible] in other applications. Much ice [illegible] America, during the hot weather, [illegible] dead bodies between death and buri [illegible]

Ice was imported into England fro [illegible] a considerable scale as early as 1823 [illegible] left to the Americans to originate a tr [illegible] article in their own cities, which has extend [illegible] Europe and Asia, and in an incredibly short s [illegible] of time attained a surprising magnitude. [illegible] export of ice from America was commenced abo [illegible] 1805, by a merchant named Tudor, who sent ic [illegible] from Boston to the West Indies. After persevering against many losses he succeeded in establishing a trade with Calcutta, Madras, and Bombay; and now not only is it sent in vast quantities to those places, but also to Hong-kong, Whampoa, and Batavia. About the year 1840 the Wenham Lake Ice Company commenced sending ice to Great Britain from Boston. The supply of ice for Great Britain, however, now comes almost wholly from Norway (mainly from Drobak, near Christiania, [illegible] christened 'Wenham Lake.'

Thirty years previously America had sent to Great Britain on an average 20,000 *tons annually*, costing £20,000.

In America the ice harvest is gathered in on an enormous scale and with an elaborate system of apparatus. The ice is cleared from snow by means of an implement called the snow-plane. An ice-plough, drawn by horses, and driven by a man riding *upon it, is then made to cut deep* parallel grooves in the ice, and these are again crossed by other grooves at right angles, so that the whole of the surface is deeply marked out into small squares, measuring a little more than three feet. A few of these square blocks being detached by hand-saws, the remainder are easily broken off with crowbars, and floated away to the ice-storehouses, which are usually built of wood, on the borders of the lake or river. Some of these are of vast dimensions, and contain vaults of great depth; the walls are double, sometimes treble, or even quadruple, being altogether as much as four feet in thickness, and having hollow spaces between to render them less heat-conducting. The blocks of ice are covered up with sawdust, a layer being placed between each tier of blocks. *Many of these* ice-houses are made large enough to hold from 40,000 to 80,000 tons of ice. The quantity of ice harvested in the United States may be guessed from the fact that Philadelphia requires an annual supply of 700,000 tons, New York and the adjoining cities, 1,200,000; while in some states the average consumption per head of the population is 1600 lb. yearly. New York is supplied from the Hudson; Philadelphia *from the Schuylkill, Delaware, and Lehigh*, as well as from the Kennebec (which claims to produce the purest and clearest ice); Boston from Wenham Lake, &c.; and the west from the great lakes. In the southern states the artificial manufacture of ice has of late largely reduced the trade in lake ice.

The *building of ice-edifices is still a* winter
sement in Russia; and, in the New World,
real set the example of an annual ice-carnival,
he features of which is the building of a
palace, and of ice-monuments of various
ring (q.v.) is the subject of a separate
boating is an exhilarating recreation,
n lakes and rivers, especially in
anadian ice-boat or ice-yacht is
at as a triangular framework of
means of a sail—with the broad
three skates or runners, 3 feet
leep. There is but one large sail,
r, fastened to a boom and yard,
er 30 feet in length. Such an ice-
ered by the rudder-skate in almost
ot *in the teeth of the wind, and may*
ge speed of thirty or forty miles an
etimes as much as sixty-five miles.
ly reduces the speed. For means
artificial freezing, see FREEZING MIX-
REFRIGERATORS.

**Age.** See GLACIAL PERIOD.

**ceberg.** See ICE.

**Iceland** is an island in the North Atlantic immediately south of the Polar Circle, which just touches the northernmost point of the island, the Melrakkaslétta. It lies between 63° 23′ and 66° 33′ N. lat., and between 13° 22′ and 24° 15′ W. long. The meridian of Ferro crosses the island in the middle. The distance from Iceland to Greenland is about 250 miles, to Norway 600 miles, to the Faröe Islands about 250 miles, and to Scotland 500 miles. Its superficial area is 40,300 sq. m. (more than a third larger than Scotland); its length from east to west 300 miles, and its breadth from north to south 200 miles. The whole length of the south coast from east to west is entirely wanting in bays and firths; the coast-line is not, however, straight, but bulges out largely in the *middle, and the north coast* has an inward corresponding curve. Other parts of the coast, especially the north-west and east coasts, are very much indented by firths and bays, as may be seen from the fact that the circumference of the island, if measured from point to point, is only 900 miles, but the coast-line following the *indentations* would be *above* 2000 miles. The principal bays and firths of the island are Faxaflói, Breithifjord (Broad Firth), and Isafjord (Ice Firth), on the west coast; the Húnaflói (Bear-cub's Bay), Skagafjord (Ness Firth), Eyafjord (Island Firth), and Skjálfandaflói (Shivering Bay), on the north coast. On the east coast there are no large firths, but *many* small ones; the best known of these is Seythisfjord (Fry Firth).

Taken as a whole, Iceland may be said to be a tableland about 2000 feet high. In some parts it slopes pretty evenly down to the coast, as is the case on the south side between Eyafjallajökull and Reykjanes. Here is the largest extent of lowland, about 1400 sq. m. *The next largest* piece of lowland is the Borgarfjord, which extends to the Snaefellsjökull range of hills, and is about 400 sq. m. The firths in the north-west, in the north, and in the east, may be looked upon as so many cuttings in the tableland effected by volcanic and glacial action during former geological periods of the island. *In most cases these cuttings* are comparatively narrow, and hills rise to about 2000 feet abruptly from the water, ending in steep precipices, which afford breeding-places to an immense number of sea-fowl. This is especially the case in the north-west and the east. In the north, and in some parts of the east, there are several broad valleys running *from the firths into the interior.* Iceland is throughout volcanic, and, according to geologists, it owes its existence entirely to volcanic action. The interior and highest part of the island consists of volcanic tufa; the hills of the east and west consist for the most part of basalt. The whole of the interior is occupied by barren sands, *lava tracts, and icefields.* The largest of these lava tracts is Odáthahraun, about 1200 sq. m. The largest icefield is that of Vatnajökull, about 3000 sq. m., and all the icefields together cover 5360 sq. m. At the south-east corner of Vatnajökull is the highest mountain in Iceland, called Öraefajökull; it is 6426 feet above the level of the sea, *and* its upper part is covered with everlasting snow or ice; and so are more or less all mountains above 4000 feet, as the snow-line is usually at from 3000 to 4000 feet. There are twenty volcanoes which have been active at one time or another since the island was inhabited. The most famous of these is Hecla (q.v.), because its eruptions have been *most frequent.* There are, however, other volcanoes, such as Laki, *near Skaptá*, which have been the seats of more gigantic eruptions. This volcano threw out in 1783 a lava stream about 45 miles in length and nearly 15 miles in breadth. Such an outpour from one volcano at one time is unexampled anywhere else. The south-west peninsula, Reykjanes, has frequently been disturbed by volcanic outbursts, which have *not* been confined to the land, but islands in the sea round it have been thrown up or submerged alternately by submarine volcanic action. As a result of this volcanic activity, 2400 *sq.* m. of Iceland are covered with lava. Many of the ice-hills have been active volcanoes during the last 600 years, such as Öraefajökull and Eyafjallajökull. These ice-volcanoes never throw out any lava, but mud and ashes. The numerous hot springs scattered about the island are also connected with the volcanic fires; these are in many parts made use of by the inhabitants for cooking and washing purposes. There is great difference in the heat of these springs; some are just warm enough for bathing, others convert their water into steam at a degree far above the boiling-point. The most famous of these hot springs is Geyser (q.v.). Earthquakes sometimes do a great deal of damage in various parts of the island.

Many considerable rivers run from the interior either north or south, but none of them are navigable, because of their rapidity. The longest are Thjórsá (Bull River) in the south, Jökulsá á Fjöllum and Skjálfandafljót in the north, each being above 100 miles in length. Of the numerous lakes, Thingvallavatn in the south and Mývatn in the north are the largest. Of the many pretty waterfalls may be mentioned Gullfoss in Hvítá, Gothafoss in Skjálfandafljót, and Dettifoss in Jökulsá.

Iceland is not rich in minerals, at least not in paying quantities. There are many sulphur-mines, and some of them have been worked till lately with English capital, but not with profit. Surtarbrandur (lignite) and brown coal are found in many places, as well as iron and lime, but it is very doubtful if it would pay to work them.

The climate of the south of Iceland is somewhat like that of the north of Scotland—i.e. rather wet and changeable, but colder. In the north of the island the climate is drier and colder still. Thunderstorms are rather rare, and usually occur in winter. The winter is mild considering the latitude, but spring and summer are frequently cold. The mean temperature of the years 1884–89 in the north was about 35° F. The greatest peculiarity of the Iceland climate is the varying mean temperature of the same month, the difference sometimes being 27°. This is owing to the arrival or non-arrival of the Greenland ice, which not unfrequently blocks up the north and east coasts of the island from April to September.

The only cereal found in Iceland is the so-called melur (*Elymus arenarius*), a kind of wild oats. Turnips, carrots, cabbages, and potatoes thrive very well, and are now cultivated to some extent. The grasses, both wild and cultivated, however, are the principal product of the island. Of trees there is the birch (*Betula intermedia*), seldom exceeding 12 feet in height, and some willows and juniper bushes; amongst the heather are found crowberries and whortleberries.

The only wild animals are the fox and the reindeer; there are both white and blue foxes. Reindeer were introduced in 1770, and there are still a few herds of them running wild on the hills in the interior; they are of very little use to the inhabitants. Of domestic animals the sheep is the most important; it is usually horned, sometimes even with three and four horns, and has some general resemblance to the blackfaced sheep of Scotland. The lambs are weaned about the end of June, and the ewes are milked. Large numbers of them are now exported alive to Scotland and England. The cows are of a small breed, but yield a larger quantity of milk in proportion to their size than most other cows. The ponies are generally about 12 hands, but very strong and sure-footed. Thousands are brought to Scotland every year. The genuine Iceland dog has some resemblance to the Eskimo dog and the Scotch collie. According to the latest statistics there are about 20,000 cattle, 500,000 sheep, and 30,000 ponies in the island. Of birds there are immense numbers, especially of water-fowl, the most important of which is the Eider-duck (q.v.); it yields large quantities of eider-down, and is almost a domesticated bird in many parts of the island. The ptarmigan is the only game-bird. The most remarkable bird of prey is the Icelandic falcon, formerly so much esteemed for falconry. Of other birds, the whooper or wild swan may be mentioned; it breeds largely in Iceland. The sea around the coasts is very rich in fish, especially cod and herring; the cod-fisheries have been carried on a long time by the islanders, and now also by the French, who employ annually between 200 and 300 vessels in this fishing. Little attention was paid to the herring-fishing till about 1880, when it was largely developed by the Norwegians, and now also by the Icelanders themselves. Finbacked whales, of late successfully fished by the Norwegians, and seals are also numerous. Many of the salmon and trout rivers are now rented by Englishmen. 'There are no snakes to be met with throughout the whole island'—to cite the whole of the memorable seventy-second chapter repeated by Dr Johnson from Horrebow's *Natural History of Iceland* (Copenhagen, 1750; Eng. trans. 1758).

Iceland was discovered about the beginning of the 9th century by Irishmen or Scotsmen, but they did not make any permanent settlement. About seventy years later it was rediscovered and colonised by Norwegians, who preferred to leave their native land rather than submit to the rule of Harold Haarfager. Many of them had previously settled in the Orkneys, Hebrides, and Ireland; and when they were not safe there from the attacks of Harold, they went to Iceland, and a considerable number of Irishmen and Scotsmen went with them. Ingolf was the first settler. In about sixty years the whole island was inhabited, and an aristocratic republic was formed, the central point of which was the Althing which met every year at Thingvellir. In 1262–64 the Icelanders acknowledged the sovereignty of the king of Norway; and in 1388, when Norway was united with Denmark, Iceland shared the same fate. When, however, Denmark had to give up Norway in 1814, Iceland remained with Denmark, because, it is said, the negotiators of
peace of Vienna in 1814 did not know the
was such an island as Iceland in existen
Althing continued under the Norwegian
rule with very limited powers till 180
abolished. In 1874 the king of Den
island a new constitution, accordin
Althing, which had been reorga
tained legislative powers in all
Iceland. The king appoints a go
thingi), who carries on the g
island under a responsible secret
Copenhagen. In the year 1000
introduced in Iceland, and a ce
bishops' sees, one at Skálholt, the
were established. About the mid
century the Reformation was introdu
and since then all the Icelanders ha
Lutherans. Church matters are now su
by one bishop at Reykjavík.

The most notable events in the history
land from its union with Norway are a long
of afflictions and calamities, caused by volca
outbursts, severe seasons, epidemics (such as th
black death in 1402, the great plague in 1494, the ravages of the smallpox), and in some cases by misgovernment. The population of Iceland in 1801 was 46,240; in 1880, 72,442; in 1888, 69,224: since 1870 there has been considerable emigration to America. In the 12th and 13th centuries the Icelanders produced more vernacular literature than any other nation in Europe, and from that time love of information has been a distinguishing feature of the Icelanders. At the present day elementary education is so general that a child of ten unable to read is quite an exception, and most of them can write also. There are several schools for children, but for the most part

education is imparted at home. There are two higher schools for general education, and a college at Reykjavik for classical instruction; there are also two other colleges for ministers and medical students. Many farmers are acquainted with two foreign languages. Reykjavik, on the south-west coast, is the capital of Iceland, with about 3000 inhabitants. There are two other villages, Isafjord in the north-west and Akureyri in the north, each with 500 inhabitants. For the rest the population is scattered all round the island on isolated farms. The principal means of support of the Icelanders are the rearing of live-stock and fishing. The chief exports are: live sheep, in 1889 about 60,000; salt mutton, 600,000 lb. annually; wool, 1,200,000 lb.; sheepskins, 20,000; tallow, 60,000 lb.; horses, about 2000; salted cod, haddock, and ling, 14,800,000 lb.; salted salmon, about 40,000 lb.; cod-liver oil, about 1800 barrels; shark-liver oil, 4000 barrels; eider-down, 6400 lb.; and feathers, 12,000 lb. The annual imports are: corn and breadstuffs, 10,971,000 lb.; coffee, 440,000 lb.; chicory, 190,000 lb.; sugar, 1,025,000 lb.; salt, 46,000 barrels; tobacco, 133,000 lb.; spirits, 42,000 gallons; beer, 16,000 gallons; petroleum, 55,000 gallons; coal, 4500 tons; fishing-lines and ropes, 55,000 lb. Besides these, timber, iron, cotton goods, and other clothing stuffs are imported. The money value of the whole of the exports is about 6,000,000 Danish crowns, or £333,334. There are now import duties on spirits and wines, tobacco, coffee, and sugar. The trade with Iceland was confined to Copenhagen for several centuries, and so is the largest part of it still. Since the year 1854 the trade has been free to all nations, and now it is going more and more to Leith and Newcastle. The only native industry consists in working the wool of the sheep into various articles of clothing; this is chiefly done by the women in winter. The Icelanders make a sort of tweed which they call vathmál, and this is the principal clothing material of the inhabitants, but is not exported. On most
ns there is an old-fashioned loom in which the
l is woven.

Troil, *Letters on Iceland* (1772); Sir George
*avels in Iceland* (1810); Henderson, *Jour-*
*ence in Iceland* (1818); C. S. Forbes,
*canoes, Geysers, and Glaciers* (1860);
Burton, *Ultima Thule: a Summer in*
J. C. Poestion, *Island das Land und*
Vienna, 1885); and A. Baumgartner,
*röer* (Freib. i. Br. 1889).

NGUAGE AND LITERATURE.—The
is now called *Icelandic* was down
ry spoken all over Scandinavia—
Sweden, and Denmark, as well as
les, Shetland, the Orkneys, the
n the coasts of England, Scotland,
It was a sister language to the
nd Old German. Formerly its name
*ga* (the Danish tongue) or *Norraena*
tongue). Its similarity to Anglo-
as so close that the ancient Icelandic
asserted that the same language was spoken
land till the arrival of William the Con-
as in Scandinavia. This is the language
ich the Norwegians brought over to Iceland in
e 9th century, and because it is now nowhere spoken but in Iceland, it is called *Icelandic*. The present Danish and Swedish stand in the same relation to it as Italian and Spanish stand to Latin. In Iceland it has undergone so little change that any Icelandic child who has learned to read can read the sagas and songs of the 12th and 13th centuries as easily as an English child can read Shakespeare. There is, however, reason to believe that the pronunciation has been somewhat altered, especially that of the vowels and two of the consonants; the *k* and the *t* have in some words been softened into *g* and ð (th) respectively. The vocabulary, the inflexions, and the grammatical construction have been preserved almost unaltered. The relationship to Anglo-Saxon and English may be seen at a glance, so many words in both languages being quite the same. We will take as instances several names of the body, as Icelandic *hönd*, 'hand;' *fingur*, 'finger;' *fotr*, 'foot;' *bak*, 'back.' And if this is the case with English, it is still more so with Scotch, for generally, where the Scotch differs from the English in pronunciation of a word, it is identical with that of Icelandic. In some cases the consonant has been softened in English where it has remained hard in Icelandic; thus the letter *h* in connection with *s* is a softened form of *k*—e.g. 'shall' is in Icelandic, *skal*; 'shell' is *skel*; 'ship' is *skip*, and instances of this kind might be multiplied infinitely. The Icelandic is an inflectional language, having four cases not only for the nouns but also for each gender of the adjectives, some of the numerals, and the pronouns. With regard to the phonetics of the language, it may be remarked that vowel change (*umlaut*) has been carried further than in any other of the Teutonic tongues. The chief characteristics which distinguish Icelandic from German and English are the ending of the infinitive in a vowel, usually *a*, the suffixing of the definite article, and the passive or middle voice of the verb. To every student of Northern history the question must occur, why this ancient tongue has been preserved in Iceland, and not as well in some other parts of the north which have been quite as isolated as Iceland. We have no hesitation in giving as reason the fact that the Icelanders were the only people who had any literature in it, and always took great interest in that literature. This literature has not merely a philological interest, but even more historical interest, as it contains a full account of the men who left their mark in every corner of Europe, who were, in fact, masters of Europe during the 9th and 10th centuries, and whose language and laws are at this moment important elements of the language and institutions of the English-speaking race. It also throws no obscure light on the beliefs and modes of life of our common ancestors.

The earliest monuments of this tongue are found in the Runic inscriptions of Scandinavia (see RUNES). The remains thus found are indeed very different from the language as it appears in Icelandic literature; there is, however, sufficient similarity to show that the language there employed is really the same. The Runic monuments range from the 8th to the 12th century. The earliest literary productions in the Icelandic tongue are the *mythical* songs contained in the so-called poetical Edda (q.v.), the collection of which has, we believe erroneously, been attributed to Sæmund the Learned, who died in 1133. It is impossible to ascertain how far these songs were brought to Iceland by the Norwegians, though some of them seem to point to a time anterior to the settlement of the island. The only thing we know for certain is, that they existed in Iceland in the later part of the 12th century. The identification of some or all of them with either Norway or the Western Islands is founded on no firmer basis than mere conjecture. These songs may be divided into mythical and heroic songs. The mythical songs contain an account of the gods and giants, the creation of the world and of man, the world-long struggle of the gods with the giants or Titans of the Northern mythology, the day of judgment, or the destruction of the gods, the giants, and the world, out of the ruins of which a new heaven and a new earth are to arise. One of the songs of this collection is the *Hávamál* (the Song of the High One—viz. Odin); it is a didactic poem containing rules of conduct in various situations and views of life. The heroic songs mostly treat of the same subject as the German *Nibelungenlied.* Some of these songs contain the most exquisite expressions of Icelandic poetry. There are several other songs of the same type as the Edda. All these songs are alliterative; their characteristics are simplicity of diction and natural expression. By the side of these popular songs a more artificial poetry was developed by the Skalds (q.v.); here rhyme was added to alliteration, and the expression was so artificial that they could be understood by the initiated only. As the theme of their poems was usually a king or chief, whose heroic deeds they celebrated in their songs, this kind of poetry has been called court-poetry. Many of these songs formed the nucleus of the later saga. Either the Skald himself, or another person who had learned his poem, would recite it, give explanations of it, and add further particulars to the life of him whom the poet celebrated, and thus the saga took shape shortly after the celebration of the events in the song. Thus a literature arose without the use of letters.

The runes were used only for inscriptions, not for literary purposes. Some authorities, however, are of opinion that the earliest Icelandic writings were in runes, but, as there is not a single tittle of such writing left as evidence, the conjecture seems very hazardous. The first Icelandic bishop, Isleif, who died in 1080, introduced the Latin alphabet, and taught young men in preparation for the priestly office. In the beginning of the 12th century another bishop had a school where Latin was taught. Shortly afterwards began that literary activity which made the Icelanders famous. The old prose literature of Iceland consists for the most part of sagas—i. e. tales,-both historical and fabulous. They are all more or less in the form of biographies; their authors are for the most part unknown. With regard to the scenes of the sagas, they may be divided into Icelandic sagas, or biographies of Icelanders in Iceland, the sagas of the kings of Norway, and sagas concerning other countries. These sagas give a faithful picture of the life and manners of those times, but chronology is usually their weakest point. The father of Icelandic literature was Ari the Learned (1067-1148). He was the first who began to write down the sagas, most of which had already been formed in the mouth of the saga-teller. The principal works of Ari are the *Landnámabók*, or account of the settlement of Iceland, containing the names, genealogy, and brief accounts of every settler. It is an evidence of very careful research and wonderful memory of the author. No other country in the world has such an account of its earliest history. He also wrote a small book called *Libellus Islandorum*, on the history of Iceland down to 1135, and an account of the introduction of Christianity called *Kristni Saga.* All these have come down to us; but he also wrote a larger book on Iceland which is lost, and the lives of the earliest kings of Norway, which are also lost except so far as they may be embodied by Snorri Sturluson (1178-1241), the historian and poet. His best-known works are the prose Edda, or manual of Scandinavian mythology and Icelandic poetry, and the Lives of the Kings of Norway, or *Heimskringla*, down to the death of Sigurd the Crusader (1130). The third name is that of Sturluson's nephew, Sturla Thordarson (1214-84), also a poet and historian. He wrote the *Íslendinga Saga*, also called *Sturlunga*, a graphic account of the feuds between the chiefs of Iceland in the 13th century, which resulted in the subjection of the island to the king of Norway. He also wrote the life of Hákon the Old, who died at Kirkwall in 1263, and that of his son Magnus. The latter is now lost except a few fragments. The sagas already translated into English are: *Heimskringla*, *Orkneyinga Saga*, the story of Burnt Njál, the story of Gisli the Outlaw, the *Viguglúms Saga*, the *Gunnlaugs Saga*, the *Volsunga Saga*, and several smaller ones.

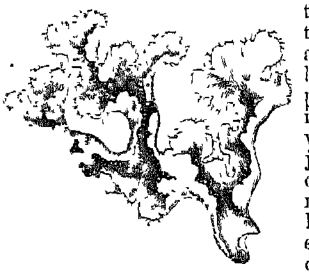
Besides the sagas and poetry there are also found grammatical essays from the 12th and 13th centuries, astronomical treatises, a guide for travellers to Rome and Jerusalem. A remarkable work appeared in the 13th century called *Konungs Skuggsjá* ('king's mirror'), which contains a philosophical contemplation of life, with rules for conduct under various circumstances and in the company of all sorts of people. The old Icelanders were no less industrious translators than original writers, for they seem to have translated any foreign book that came into their hands. Thus they translated many medieval romances, such as the legends of King Arthur, and these translations are now of great value for the textual criticism of the originals. Among the most remarkable translations of those times is a version of the Old Testament, intermingled with various observations on natural history, compiled from medieval sources. This is perhaps the oldest translation of the Bible in any living language. There are also translations of a great number of homilies, of lives of saints, and legends of the church. The code of laws of the Icelandic republic, called Grágás (gray goose), first written down in 1118, affords ample evidence of great skill in legislative enactments, and is well worth studying in connection with the legal history of other Teutonic nations.

Shortly after 1300 the literary productiveness of the Icelanders ceased, except for the writing of annals, which had begun in the preceding century. The principal literary activity of the 14th century consisted in copying and making collections of the labours of former centuries. Many of the sagas have been preserved in these copies only, the
ginals being lost. The 15th century is a
blank as far as literary activity is concern
except a few song-writers; yet even
were some students of the old sag
middle of the 16th century a new
to the literary pursuits of the Ic
introduction of the Reformation.
was translated and published i
other theological works from Da
In the 17th century the interest i
was reawakened, and many parc
scribed. At this time also the co
scripts began, and they were ca
Sweden and partly to Denmark.
country they were taken by the
collector Arni Magnússon, who died i
having bequeathed his collections to th
of Copenhagen. There is no doubt t
portation of the manuscripts was very
for their preservation. From this time the
treasures of Iceland began to be known abroa
the first to make known the historical value of th
sagas was the Icelander Torfæus, who died in 1719.
Since then there has been no want of diligent and careful students of Icelandic literature both among Icelanders, Scandinavians, Germans, and lately also among the English.

The literary activity of the modern Icelanders is not confined to the study of the old literature alone; there is also a considerable modern literature, though it is comparatively less interesting. Iceland has always been and still is rich in song-writers, especially of a lyrical and religious tendency. To the natural history and the history of the island itself there have been valuable contributions. Considering the population and other circumstances of the island, it cannot be denied that the Icelanders at the present day compare favourably in respect to literary activity with any other people in similar circumstances.

The best guide to the old literature of Iceland is to be found in the *Prolegomena* to the *Sturlunga Saga*, edited by Dr G. Vigfússon (Oxford, 1878). See also the *Corpus Poeticum Boreale*: the poetry of the Old Northern tongue to the 13th century (2 vols. 1883), edited, translated, and illustrated by Vigfússon and Powell. Cleasby and Vigfússon's great Icelandic-English dictionary (1874) is the standard one. There is a list of *Books printed in Iceland*, by Fiske (1890).

**Iceland Moss** (*Cetraria islandica*), a lichen found in all the northern parts of the world, and valuable on account of its nutritious and medicinal properties. It is collected as an article of commerce in Norway and Iceland. In very northern regions it grows even near the level of the sea; in more southern countries it is found on mountains. It is not uncommon in the mountainous parts of Britain, although not turned to any economic account. In Carniola it is used for fattening cattle and pigs. It grows in extreme abundance in Iceland on tracts otherwise desert; and numerous parties migrate from great distances with horses, tents, and provisions, in the summer months, for the sole purpose of gathering it as an article of commerce and for food. In many places this lichen thickly covers the whole surface of the ground, growing about 1½–4 inches high, and consists of an almost erect Thallus (q.v.). It is of a leathery and somewhat cartilaginous substance. When Iceland moss is used as an article of food its bitterness is first partially removed by steeping in water, after which, in Iceland and other northern countries, it is sometimes pounded and made into bread; or it is prepared by boiling, the first water being rejected. It is often boiled with milk, making a kind of jelly, either with milk or water. It is an agreeable article of food, and invalids. It contains about 80 l of starch called *Lichen Starch*, owes its bitterness to an acid *Acid*.—An allied species, *Cetra-* ing in northern countries, pos- roperties.



*raria islandica*).

**par,** transparent calc-spar, or cal- it may be split along its cleavage- n obtuse rhombohedron, and is doubly . See CALCITE.

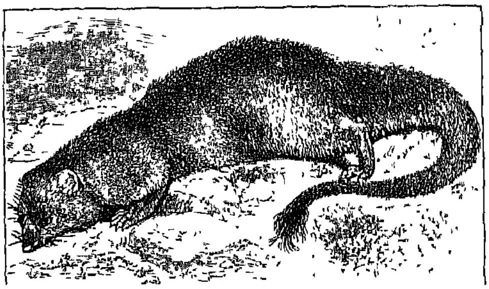
See BOADICEA.

**Ice Plant** (*Mesembryanthemum crystallinum*), annual herbaceous plant, a native of Africa d of the south of Europe, remarkable for the tery vesicles (*papulæ*) with which its whole rface is covered, and which have the appearance of granules of ice, and sparkle in the same manner in the sun. It is common as a tender annual in our greenhouses, and grows in the open garden during summer; the leaves are used for garnishing dishes. The expressed juice of the plant has been greatly extolled as a remedy for diseases of the mucous membrane of the lungs and urinary passages, and also for dropsy. The seeds are used for food in the Madeira Islands. The ashes supply barilla, and the plant is burned on this account in countries where it abounds. The plant is valuable for extracting soda, potash, and other alkaline salts from unproductive soils, rendering them fit for culture. It is so used in the south of France.

**Ichang,** a walled town in the Chinese province of Hu-pei, stands on the Yang-tsze-kiang, where it escapes from the limestone gorges and ravines of its middle course, and 1000 miles from Shanghai at its mouth. In 1877 it was declared open to foreign trade, but in consequence of the difficulties connected with the navigation of the river, the competition of the Chinese, and the jealousy of the Chinese officials it advances but slowly. Nevertheless, the net value of the trade notified to the foreign customs-office increased from £21,304 in 1878 to £1,136,987 in 1887. In the three years 1885–87 the imports (chiefly shirtings, lastings, cloth, and silver in ingots) averaged £489,047, and the exports (silk, white wax, drugs, musk, tin, silver in ingots, &c.) averaged £497,596. Imports from Great Britain average £295,650 annually. Ichang is connected with Hankow by telegraph, and so with the outer world. Pop. 33,575. See Little, *Through the Yang-tse Gorges* (1888).

**Ich Dien** ('I serve'), the motto of Edward the Black Prince, whose badge was a single ostrich feather, afterwards three ostrich feathers. The story that he adopted both motto and badge from John, the blind king of Bohemia, after the battle of Crécy, is not borne out by historical investigation. Since Edward's time the motto 'Ich Dien' and the badge of three ostrich feathers have been employed as the cognisance of the Princes of Wales. See *Dict. Nat. Biog.*, vol. xvii. p. 92.

**Ichneumon** (*Herpestes*), a genus of digitigrade carnivorous quadrupeds of the family Viverridæ, having a much elongated body, small head, sharp muzzle, rounded ears, and short legs. The species, which are pretty numerous, are natives of Africa and the warmer parts of Asia. One, the Andalusian Ichneumon (*H. ichneumon*, var. *Widdringtonii*), occurs in the south of Spain. They feed on small quadrupeds, reptiles, eggs, and insects. Some of them, particularly the Egyptian Ichneumon (*H. ichneumon*) and the Mangouste, Mongoose, or Mungoose (*H. griseus*) of India, have been greatly celebrated as destroyers of serpents and other noxious reptiles, many wonderful fables being superadded to the truth on this subject. The Egyptian Ichneumon, the ichneumon of the ancients, is larger than a cat, gray, with black paws and muzzle. It was a sacred animal among the ancient Egyptians. The ichneumon is easily domesticated, and is useful in keeping houses free of rats and other vermin. It is therefore not unfrequently domesticated in Egypt, as the mongoose also is in India. This species is rather smaller, of a lighter colour, and has a pointed tail. Introduced into Jamaica, the mongoose did admirable service in clearing the sugar-cane fields of rats; but became



Egyptian Ichneumon (*Herpestes ichneumon*).

a plague by destroying poultry and harmless animals.

**Ichneumon,** a name applied to the members of a very large family of insects (Ichneumonidæ), included in the order Hymenoptera, and notable because the larvæ are parasitic in, or sometimes on, other insects. There are several thousand species, represented in all parts of the world, including many minute forms and also some of the largest insects. The long antennæ have many joints; the abdomen is usually joined to the thorax by a narrow waist; the females are provided with ovipositors, which are in some cases very prominent. With these they lay their eggs in the ova, larvæ, or adults of other insects, and sometimes also of spiders. The ichneumon embryos develop in the safe and comfortable hiding-place thus afforded, and utilise their hosts as food for a while, but sooner or later, before or oftener after pupation, leave them dead or dying. Sometimes, curiously enough, the ichneumons themselves fall victims to a similar trick played upon them by members of the same or nearly related families. As adults, these insects feed on the juices of flowers. The parasitic habit of the larvæ is sometimes of economic importance, since they thus destroy injurious insects. Thus, *Microgaster glomeratus* and *Pimpla instigator* are parasitic on the caterpillars of the cabbage butterfly, and *Aphidius* upon aphides.

**Ichnology** (Gr., 'science of footprints'). See FOSSILS.

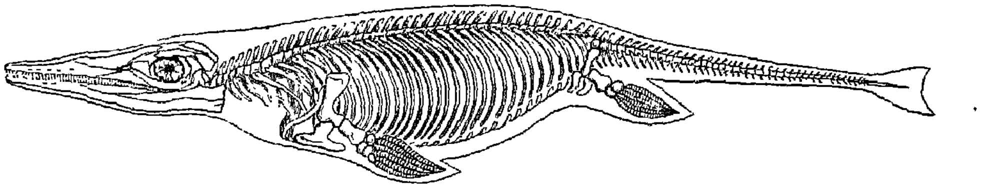
**Ichor,** the ethereal fluid that supplied the place of blood in the veins of the gods of Greek mythology. The name is applied in medicine to the thin watery discharge from a wound.

**Ichthyodorulite** (Gr., 'fish-spear-stone'), the name given to fossil fish spines, not uncommon in the stratified rocks.

**Ichthyology** (Gr. *ichthys*, 'a fish,' *logos*, 'a discourse'), that branch of natural history which treats of Fishes (q.v.).

**Ichthyornis.** See ODONTORNITHES.

**Ichthyosaurus** (Gr., 'fish-reptile'), a remarkable genus of reptiles which inhabited the sea during the deposition of the Mesozoic strata. Like the modern Cetacea, their structure was modified to suit their aquatic life. The body was shaped like that of a fish, the limbs were developed into paddles, and the tail, long and lizard-like, was furnished, it is believed, with a fleshy fin, as in the dolphin, except that its position was vertical. The head was large, and produced into a long and pointed snout, resembling that of the crocodile, except that the orbit was much larger, and had the nostril placed close to it, as in the whale, and not near the end of the snout. The jaws were furnished with a large series of powerful conical teeth, lodged close together in a continuous groove, in which the divisions for sockets, which exist in the crocodile, were indicated by the vertical ridges on the maxillary bone. The teeth were hollow at the root, sheathing the young teeth, which gradually absorbed the base of the older ones, and, as they grew, pressed them forward, until they finally displaced them. The long and slender jaws were strengthened to resist any sudden shock by being formed of many thin bony plates, which produced light and elastic as well as strong jaws. The most remarkable feature in the head was the eye, which was not only very large—in some specimens measuring 13 inches in diameter—but was specially fitted to accommodate itself for vision in air or water, as well as for speedily altering the focal distance while pursuing its prey. The structure, which thus fitted the eye so remarkably to the wants of the animal, consists of a circle of thirteen or more overlapping sclerotic bony plates surrounding the pupil, as in birds. This circle acted as a sort of self-adjusting telescope, and, assisted by the extraordinary amount of light admitted by the large pupil, enabled the ichthyosaurus to discover its prey at great or little distances in the obscurity of the night, and in the depths of the sea. The neck was so short that the body was probably not in the least constricted behind the head. The backbone was fish-like; each joint had both its surfaces hollow, making the whole column very flexible. The small size of the paddles compared with the body, and the stiffness of the short neck, seem to suggest that the tail must have been an important organ of motion. Professor Owen is satisfied that it was furnished with a vertical tail, because the vertebræ are compressed vertically, and also because the tail is frequently found disarticulated a short distance from its extremity, as if the weight of the upright tail
had caused it to fall when the anima
decompose. The fish-like body, th
and especially the powerful tail
ichthyosauri active in their move
quently, with their predaceous ha
ous enemies to the other anima
with them the Mesozoic seas. T
food consisted of fishes is evident
of broken bones and scales of co
that have been found under their
where the stomach of the ani
Not infrequently entire skeletons
viduals have been found within th
abdominal cavity of larger ones. As
skeletons are complete and uninjured
same species as that in which they occur,
Seeley thinks that some of the ichthyosau
viviparous.



Ichthyosaurus.

The remains of ichthyosauri are peculiar to the Mesozoic strata, occurring in the various members of the series from the Lower Lias to the Chalk, but having their greatest development in the Lias and Oolite. More than thirty species have been discovered; they differ from each other chiefly in the form of the head, some having a long and slender snout, like the gavial of the Ganges, while others had short and broad heads, more like the common crocodile. The great repository for ichthyosaurian remains hitherto has been the Lias at Lyme Regis.

**Ichthyosis,** or FISH-SKIN DISEASE, is characterised by a hardened, thickened, rough, and almost horny state of the cuticle in severe cases. Instead of exfoliating in fine, almost invisible flakes, it accumulates in irregular scale-like pieces, which may be removed, but are speedily reproduced. Perspiration is always absent or very deficient in the affected areas. The disease may affect almost the whole surface, or may be confined to a single part; and is most frequently, but not always, congenital. It is attended by no constitutional disturbance, and the general health is often very good. The disease is, however, extremely obstinate, and when congenital may be considered as incurable. Treatment consists in the frequent use of warm or vapour or alkaline baths, so as to soften the thickened epidermis and to facilitate its removal, and friction by means of a piece of flannel or pumice-stone may be conjoined with the bath. The application of sulphur or resorcin to the skin has also the effect of promoting desquamation. The employment of sulphureous baths, such as those at Harrogate, has occasionally been found of temporary use; and the internal administration of tar, cod-liver oil, &c. sometimes gives relief.

**Icknield Street** (Lat. *Via Iceniana*), an ancient Roman road of Britain, which ran from Norfolk south-westwards to the vicinity of Land's End.

**Icolmkill.** See IONA.

**Icon Basilike.** See EIKON.

**Iconium**, an ancient town of Asia Minor, situated on the western edge of the plateau that skirts the northern slopes of the Taurus Mountains, 310 miles E. of Smyrna. The capital under the Romans of Lycaonia, it was three times visited by St Paul, who founded there a Christian church. In 708 it fell into the hands of the Arab conquerors. Its prosperity culminated in the end of the 11th century, when it was made the capital of the Seljuk empire. In 1190 Frederick Barbarossa defeated the Turks in the neighbourhood, and captured Iconium. Some fifty years later its sultans were made the political playthings of the Mongols; and in 1392 they submitted to the suzerainty of the [illegible]ttoman Turks, though the state was not incor[illegible]ed in the Ottoman empire until 1486. Being [illegible]eting-point of some of the principal high[illegible] Asia Minor, and a place of considerable [illegible]ailed not to figure prominently in the [illegible] Turks. In 1832 Ibrahim Pasha de[illegible]ks there.—The modern town, called [illegible]NIYA, the capital of the Turkish [illegible] is a place of 20,000 or 30,000 [illegible] live by commerce, by making [illegible]es, and on the contributions of [illegible]ims who visit the sacred tombs [illegible]ces of the town. Here is the [illegible]y of the Mevlevi or 'dancing' [illegible] Ottoman empire. Numerous ruins [illegible]adrasas (colleges), &c. attest the [illegible]ndour of the place.

**[illegible]asts** (Gr. *eikōn*, 'an image,' and *klazō*, [illegible] the name used to designate those in the [illegible]om the 8th century downwards, who have [illegible]posed to the use of sacred images (i.e. [illegible]atues, pictures, and other sensible representa[illegible]s of sacred objects), or at least to the paying [illegible] religious honour or reverence to such representations. The iconoclast movement had its commencement in the Eastern Church. Opinion is divided as to the origin and antiquity of the practice of Image-worship (*q.v.*) in the church; but it is certain that in the 6th or 7th century it prevailed extensively, especially in the eastern empire, and that practices existed in some churches which were a source of much suspicion, and even of positive offence. Many bishops interposed to correct these abuses; but the iconoclast movement, strictly so called, began with the imperial edict issued in 726 by the Emperor Leo III., surnamed the Isaurian, forbidding the honours paid to sacred images, and even commanding the removal from the churches of all images, that of our Lord alone excepted. This was followed by another decree in 730, which prohibited, under pain of death, as sinful and idolatrous, all acts of reverence, public or private, to images, and directed that wherever such images should be found they should forthwith be removed or destroyed. The attempt to enforce this decree aroused great opposition, especially in the Greek islands and in Italy. The popes Gregory II. and Gregory III. protested vehemently against it, repudiated the imputation of idolatry, and explained the nature of the honours to images for which they contended. Leo persevered, nevertheless, in his opposition, which was continued by his successor, Constantine, surnamed Copronymus. Under this emperor a council was held in Constantinople in 754, in which the iconoclast decrees were affirmed in their fullest extent; and Constantine's son, Leo IV., renewed, on his accession in 775, the enactments of his predecessors. Under the widow of Leo, the Empress Irene, a council was held at Nicæa (787), in which these proceedings were condemned and revoked; but other succeeding emperors, Nicephorus (802–811), Leo V., the Armenian (813–820), Michael II., the Stammerer (820–829), and Theophilus (829–842), returned, with greater or less severity, to the policy of the iconoclast emperors. As regards the Greek Church the controversy may be said to have been finally settled under the Empress Theodora in a council held at Constantinople in 840, or at least by a subsequent one of 870. The modern usage of the Greek Church permits pictures, but rejects graven or sculptured representations of sacred objects. Except in Italy, the iconoclast controversy created but little sensation in the Western Church until the movement in the time of Charlemagne and his successors, to be noticed under the head IMAGE-WORSHIP.

**Ictinus.** Of Ictinus, who shares with Callicrates the glory of having designed the one perfect building which the world has ever seen, very little can be stated with certainty. In addition to his masterpiece, the Parthenon, the temple of Apollo Epicurius at Bassæ, near Phigalia, the sculptured reliefs from which are now in the British Museum, may be ascribed to him. He is also known to have been the architect of a temple at Eleusis, and to have written an exhaustive treatise upon the Parthenon, with which his name is indissolubly connected. See ATHENS.

**Ida**, a mountain-range in Asia Minor, extending from Phrygia through Mysia into the Troad. The city of Troy was situated at its base. It is the scene of many ancient Greek legends. The southern part of the range was called Gargarus, the highest peak of which is 5749 feet above the sea. Here there was a temple of Cybele, who therefore was called the *Idæan Mother*. From Ida flow several famous streams, as the Granicus, Simois, and Scamander.—There is another Ida (8055 feet) in Crete, extending from west to east, now called Psiloriti. Here Zeus was said to have been educated.

**I'daho**, a territory of the United States, is situated between the 42d and 49th parallels of latitude, and mainly between the 111th and 114th meridians of longitude. In shape it is an irregular trapezoid. Its maximum length is about 490 statute miles; its breadth varies from about 42 miles at the 'pan-handle' which forms the northern part, to 300 miles along the southern boundary. Its area is about 84,800 sq. m.

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One of the main ranges of the Rocky Mountains, in various parts called the Cabinet, Cœur d'Alene, and Bitter Root mountains, forms the north-eastern boundary, separating Idaho from Montana. In the southern part this range is a portion of the continental divide between the Atlantic and Pacific oceans. About 70,000 sq. m. of the territory is situated in the drainage basin of the Columbia River; the remaining part lies in the Great Basin, its surface waters flowing into Great Salt Lake.

A comparatively small area in the south excepted, the entire surface is rugged and mountainous. In addition to the high range on the north-eastern border spurs of this range traverse the territory in a direction generally east and west. Of these Salmon River Mountains are perhaps the most noteworthy, as they separate what is popularly known as Northern Idaho from the plateau-region in the central and southern part. All these ranges are high, their summits reaching elevations of 10,000 feet and upwards. The average altitude of the territory is about 5000 feet. The lowest level is the valley of Snake River, which at Boisé City is 2000 feet above the sea-level. In the south are a number of irregular ridges largely shaped by erosion, locally known as the Bear River Mountains, Goose Creek Mountains, South Mountains, Blackfoot Range, &c. A part of the plateau-region is included in the great lava flood which occurred in comparatively recent geological times, and which is still noticeable in the cliffs and mesas that diversify the surface.

Snake River—also known as Shoshone, and as Lewis River—drains by far the largest part of the territory. Its course (about 850 miles in length) lies in a valley remarkable for scenic beauty. In various places the valley widens out into broad savannahs susceptible of a high degree of cultivation. The open valleys alternate with narrow cañons through which the river flows in dalles and cataracts. This river is navigable from the mouth of Powder River to Salmon Falls, a distance of 200 miles. Salmon River, one of the largest tributaries of Snake River, drains the central part. The character of its valley is much like that of the latter. Clearwater, Payette, Boisé, Weiser, Bruneau, Malade, and Goose rivers are tributaries, important mainly for the fertile lands which flank their courses. Pend d'Oreille, or Clarke's Fork, drains Northern Idaho. Its main tributaries are Cœur d'Alene and St Joseph rivers. Dalles, cascades, and cataracts characterise all the rivers of the territory. Shoshone Falls almost rival those of Niagara in grandeur.

There are two lake-regions: one in the panhandle, the other in the south-east. The former includes Pend d'Oreille, Cœur d'Alene and Kaniksu lakes; the latter, John Day and Bear lakes. The surplus waters of Bear Lake flow through Bear River into Great Salt Lake. These lake-regions abound in game, and are perhaps the finest hunting-grounds in the United States.

Among the wild animals are the grizzly bear, two species of brown bear, the black bear, raccoon, panther, badger, wolf, fox, and coyote. Fur-bearing animals are represented by the lynx, mink, and beaver. The bison, once common, is now rarely if ever seen. The moose and elk are occasionally met with. Deer of two species and antelope are numerous. The Rocky Mountain sheep is found in the Cœur d'Alene Mountains.

Vegetation is abundant in the northern and central parts, but somewhat deficient in the arid lands of the south. Forests of conifers, including white, yellow, black or lodge-pole, and sugar pine, as well as several species of cedar and spruce, cover the western slopes of the Bitter Root and Cœur d'Alene mountains. These forests embrace a wealth of timber not surpassed by any other equal area on the continent. Fir, tamarack, and larch are also abundant. In the central and southern part the forests give place to extensive mesas overgrown with sage brush, and rolling lands covered with bunch grass. The river-valleys are dotted with occasional groves of cottonwood and thickets of wild fruits, such as the blackberry, wild currant, salal, and fox-grape.

The mineral wealth of the territory consists chiefly in its mines of silver, lead, gold, and copper, productive in the order named. In 1889 the output of these metals aggregated $17,000,000. Coal of good quality has been discovered in seven of the eighteen counties. In the basin-region of the south-east soda, gypsum, sulphur, and minerals common to lacustrine deposits abound. Mineral springs are numerous.

The climate is exceedingly healthy. The extremes of temperature rarely range beyond 0° and 90° F., except in regions of great altitude. The rainfall, abundant in the north, is deficient in the south, so that irrigation is necessary to ensure full crops. In 1889 the agricultural products, stock and farm, aggregated about $10,000,000. Grain-farming is of necessity confined to the narrow river-valleys, and, as a whole, the territory is better adapted to stock-raising than to cultivation. The crops are largely moved by wagon-trains and river-boats, but there were in 1890 about 1000 miles of railway.

Politically the territory is divided into eighteen counties. The government is similar to that of other territories. The population, distributed mainly along the river-valleys of the southern and western parts, was returned at 14,999 in 1870, and 32,610 in 1880; in 1889 it was estimated at about 117,000, one-fifth consisting of people of the Mormon faith. There are also upwards of 10,000 Indians not included in the foregoing numbers. The public schools and religious and charitable institutions are well supported.

*Boisé City, the capital and largest city,* has
population (1889) estimated at 5000. Lewi
Hailey, Murray, and Malade are pro
business centres.

**Iddesleigh,** EARL OF, Conservativ
better known as Sir Stafford Northc
of a very old Devonshire family,
1818, and was educated at Et
College, Oxford, gaining a first-cl
He began public life in 1843 as p
to Mr Gladstone, who was then
Board of Trade. In 1847 he was c
and four years later succeeded his
eighth baronet. He was secretar
missioners of the Great Exhibitio
services was created a C.B. In 18
parliament as Conservative member
and in 1858 was elected for Stamford,
North Devon. He sat for the latter co
until 1885. He was Financial Secreta
Treasury in Lord Derby's ministry of 185
1866 he was appointed by the same prime-m
President of the Board of Trade. He had already demonstrated his knowledge of finance by his treatise entitled *Twenty Years of Financial Policy,* published in 1862. While at the India Office in 1868 Sir Stafford Northcote was charged with the responsibility of the Abyssinian Expedition, which under his auspices was carried to a successful issue. In 1871 his old ally Mr Gladstone appointed him British Commissioner to the United States for the adjustment of the Alabama difficulty. Sir Stafford Northcote was Chancellor of the Exchequer in Mr Disraeli's ministry of 1874, and among other useful measures which he introduced, in addition to his budgets, was the Friendly Societies Bill of 1875. In the debates on eastern affairs and the Suez Canal he rendered signal service to the government. When Mr Disraeli went to the Upper House Sir Stafford

succeeded to the leadership in the Commons, and his task was very arduous in connection with the Irish debates. Upon the death of Lord Beaconsfield he became joint leader of the Conservative party with the Marquis of Salisbury. His management of the Tories in the Lower House during several years of opposition elicited warm eulogiums. When Lord Salisbury came into power in 1885 Sir Stafford Northcote was raised to the peerage, under the title of Earl of Iddesleigh and Viscount St Cyres, and was appointed First Lord of the Treasury. He sat as chairman of the committee appointed to inquire into the depression of trade. In 1886 he was the recipient of a handsome testimonial, subscribed by members of both political parties. In Lord Salisbury's second ministry Lord Iddesleigh was Foreign Secretary; but he resigned this post early in January 1887. On the 12th of the same month he died very suddenly at the premier's official residence in Downing Street. Lord Iddesleigh was elected Lord Rector of Edinburgh University in 1883, and during his tenure of office delivered an excellent address to the students on 'Desultory Reading.' See his collected *Lectures and Essays* (1887), and the Life by Andrew Lang (1890).

**Idea.** This word has borne very distinct meanings in the history of philosophy. Down to the 17th century it had the signification given to it by Plato, and referred to the Platonic doctrine of eternal forms existing in the Divine mind, according to which the world and all sensible things were framed. The word was used in this sense in literature as well as in philosophy down to the 17th century, as in Spenser, Shakespeare, Hooker, and Milton.

In speaking of the mental representation of external things, Descartes, instead of employing the various terms *image*, *species*, *phantasm*, &c., had been the words formerly in use for that signification, used the word idea. In s followed by other philosophers, as, for ocke, who states that he has adopted and for 'whatever is the object of the when a man thinks.' Thus, the n that we are supposed to have he sun without seeing the actual idea of the sun. The idea is th the sensation, or the feeling the senses are engaged directly on the thing itself. But the variously used, as by Berkeley, gel (see these articles). For ee COMMON SENSE, LOCKE.—erm used almost as variously as may be a theory concerning our external existence, restricting mind owledge of its own state, whereas the *realism* implies a direct knowledge of the al. Idealism may be also a theory as to the ure of the universe, and be spoken of (rightly wrongly) as *subjective* idealism, as in Fichte .v.), *critical* as in Kant (q.v.), or *absolute* as n Hegel (q.v.). See also BERKELEY. In the medieval controversies between nominalism and realism, realism was a kind of idealism (see NOMINALISM). Idealism is also used for ethical and æsthetic systems which adopt an ideal standard of estimating character, human possibilities, or subjects in art (see REALISM). The word realism has a further peculiar sense in Herbart (q.v.).

**Ideler,** CHRISTIAN LUDWIG, astronomer and chronologist, was born 21st September 1766, near Perleberg, in Prussia, and, after holding various offices, received a professorship at the university of Berlin in 1821. He wrote several valuable works on chronology, and died August 10, 1846.

**Ides.** See CALENDS.

**Idiocy** is defined by Ireland as 'mental deficiency or extreme stupidity depending upon malnutrition or disease of the brain occurring either before birth or before the evolution of the mental faculties in childhood; while Imbecility is generally used to denote a less decided degree of such mental incapacity.' The difference between both conditions and *dementia* (see INSANITY) is that the dement was once sane and responsible, the idiot and the imbecile never developed mental capacity at all; they remained arrested children. The name *amentia* has been given to idiocy. The mental faculties never showed themselves in any high degree, because the organ of mind in the brain never developed. There are great varieties of idiocy and imbecility. Some of the lowest have no speech, no power of distinguishing between one person and another, no affection or hatred, no feelings of pleasure or pain, no power to take care of themselves, and can never be taught any of these things. In body such idiots are dwarfish, misshapen, ugly, with the features and expression of face often of the lowest of the lower animals, with no power of walking. This being the condition of the lowest varieties, they rise gradually in the scale till many imbeciles are beautiful in features, and reach normal bodily development, but are slightly wanting in some essential mental faculty, in intelligence, or in affection, or control, or self-guidance. The mental deficiency is in by far the majority of idiots and imbeciles accompanied by corresponding bodily weaknesses of some sort.

Idiots and imbeciles differ much in their capacity for further development under even favourable circumstances. Some can be greatly elevated towards the standard of average humanity, and can even be rendered fit to earn their own livelihood in simple trades or manual labour, while others cannot be in any way improved. They are especially subject to certain bodily diseases of degeneration, such as scrofula, consumption, rickets, and diseases of deficient nutrition generally. Two-thirds of idiots die of consumption. The great aims in treatment are to improve the bodily nutrition, the nervous and muscular action, and the habits, to teach co-ordinated movements and simple employments, such as gardening, mat-making, carpentering, &c., and to evolve the possible intelligence by an education through the senses. Some of them have one faculty or capacity fairly or even extraordinarily developed, while the general mental power is weak. Some are good musicians. Some can calculate well, while others are ingenious in constructiveness. Such faculties have in those cases to be especially cultivated. For this purpose good food, exercise, drill, warmth, fresh air, and music are necessary, and a careful study and testing of each case to find out its strong and weak points; and teachers who devote themselves to this particular kind of educative process are required. For most of them this can only be done in Training Schools for Idiots and Imbeciles, of which there are about twelve fully equipped in the United Kingdom. It is felt by many persons that in addition to these a kind of school is needed between them and the ordinary school, for the purpose of developing 'backward children,' of whom there are a considerable proportion in our schools—a deadweight on our teachers and on the progress of the ordinary scholars. Education should be suited to the educability and the inherent brain-capacity of the scholar. Congenital idiots and imbeciles may have *attacks of acute insanity*, for which they may need to be sent to asylums for the insane; but as a general rule such institutions are not suitable for them. Few benefactors of their kind deserve more honour than the pioneers in the right treatment and education of idiots and cretins, such as Read, Howe, Seguin, and Guggenbühl. Few things must have looked so disheartening, unattractive, and unpromising of good results. But from a scientific point of view, both psychologically and physiologically, the undeveloped minds and bodies of this class have great interest and high importance.

Ireland classifies idiocy into ten divisions: (1) Genetous, (2) Microcephalic, (3) Eclampsic, (4) Epileptic, (5) Hydrocephalic, (6) Paralytic, (7) Cretinic, (8) Traumatic, (9) Inflammatory, and (10) by deprivation of the senses. From this it is seen that there are many pathological causes of the disease. It is a popular error to suppose that all idiots have small heads. Three-fifths of them have larger heads than average men, and only a few (the microcephalic) are small-headed. It is quality more than quantity of brain that counts for mind. *Cretinism* is a very interesting variety of idiocy and imbecility, and is the subject of a separate article. The general causes of idiocy have not yet been fully made out. It is unquestionably hereditary in at least 50 per cent. Consanguine marriages are the cause of idiocy beyond doubt, but only when the stock is bad, and so any tendency to nervous disease in the parents is doubled in the children. Scrofula is another fertile source of this degeneration of humanity, and there is ground to believe that frights to the mother when pregnant cause a small proportion of the idiocy of the world. But idiots are born in apparently perfectly healthy families. Evolutionally idiocy, imbecility, and cretinism may be looked on as reversions to a lower type, and so an example of one of nature's ways of bringing a bad stock to an end by stopping reproduction. Idiots and imbeciles are regarded as children all their days by the law, and provisions are made for the appointment of tutors and curators for them. They are held irresponsible for their acts. See Dr W. W. Ireland, *Idiocy and Imbecility* (1877).

**Idiosyncrasy.** See Antipathy.

**Idle,** a town in the West Riding of Yorkshire, near the Aire, 3 miles N. by E. of Bradford, like which it is a seat of the woollen manufactures. Pop. of township (1851) 7118; (1881) 16,375.

**Idocrase.** See Vesuvian.

**Idolatry** is the worship paid to an image which is held to be the abode of a superhuman personality. It is widely spread among primitive religions, as the ideas underlying it form an essential part of the savage philosophy of the universe everywhere. Yet it is not itself a primitive worship, being absent among Bushmen, Hottentots, Fuegians, Veddahs, and Eskimo, while present in the great civilisations, as the Egyptian, Chaldean, Indian, Greek, and Roman, and nowhere in more splendid development than in the Mexican and Peruvian. The idol, as something visible and concrete, helps the savage to give a definite form to his vague ideas of higher beings, just as the doll embodies to the child the notion of distinct personality. We may dismiss the idea that idolatry represents a decadence of the religious sentiment, degenerating from a conception of the Divine as absolute spirit to its symbolical representation under human or animal forms. In reality it marks a stage of progress in religious growth, when man rising above the vague adoration of personified objects, conceives of gods under the form judged most worthy of their habitation. In theological phraseology the term idolatry is often used loosely as covering all forms of worship of seen as opposed to unseen existences, thus including *litholatry*, *dendrolatry*, *zoolatry*, *pyrolatry*, *sabæism*, and even such forms of worship as *necrolatry*. The earlier stages of idolatry are *naturism*, or the worship of mere objects personified, and *animism*, or the belief in spirits as distinct from things and accustomed to exercise influence upon the affairs of men. It is incorrect to say that idols invariably begin with being symbolical representations, and are next taken for the image, and lastly for the body itself of the divinity, through forgetfulness of their primitive signification. And all images which represent a superior being and are worshipped are not idols, but only those which are believed to be conscious and animate. Yet the distinction is not precise, and indeed within the range of the same religion the images of the Divinity remain for some animate individualities—actual embodiments of spirits—for others mere symbols, like the Madonna and Child which help to warm the piety of the faithful in Catholic countries, or the photograph which brings a distant mother the more distinctly to the memory of an Australian colonist. In course of time the idol tends to become confounded with the idea of which it was the symbol, hence superstition and delusion ensue: but the missionary's iconoclastic zeal is often as unintelligent as the grown man's indignation at the child fondling its doll. It must not be forgotten that the savage mind is ever prone to confound a subjective relation with an objective one. To make the image of an object for him is to reproduce it, and by means of the portrait he passes easily to the notion of reaching its original.

There is a continuous transition from fetichism to idolatry, and the one is commonly the antecedent of the other. Fetichism is strictly the belief that the possession of an object can procure the services of the spirit lodged within its interior, and hence any material object is capable of being made a fetich, provided only it is capable of being appropriated. Naturally the fetich of stone or wood is the one most easily transformed into an idol, and early it is carved, shaped, and polished, like the Greek *xoana*, or ornamented with coloured feathers or the like. A new step is taken when on the summit of the stone or column there is sha[illegible] human head, like the *hermes* of the Greeks [illegible] once the head is formed the rest of t[illegible] follows naturally. Idols are most oft[illegible] less artistic imitations of the hum[illegible] made colossal or monstrous to r[illegible] power or dignity; and it is a so[illegible] development of commercial Christ[illegible] is an active manufacture of these [illegible] of Birmingham and elsewhere, to [illegible] India, it may be, in the same [illegible] missionaries. To the savage min[illegible] the equal of man, and it is quite [illegible] also should become the dwelling-plac[illegible] either in its ordinary form or in mixed [illegible] animal forms, like the monstrous crea[illegible] ancient Chaldeans. But in general [illegible] form predominates in the conception [illegible] because the natural anthropomorphism [illegible] attributes to his deities human thoughts a[illegible] feelings, and thus ends with lending them also [illegible] human physiognomy. Even such developments [illegible] idolatry as the apotheosis of the phallic emblem and its representation in wood or stone is but a specialised form of the anthropomorphic spirit.

Idols which receive the worship of a nation or a tribe are a simple development of fetiches in human form which belong to individuals. Thus side by side with idols which are the object of public worship we find others that are merely individual or domestic fetiches, like the small figures buried by the ancient Egyptians in their graves, and the *teraphim* which Rachel stole from Laban, and hid in the camel's furniture on which she sat. The worship of the dead may also lead us to idolatry by the same transitions as the worship of spirits.

They form a large and powerful class of spirits; and it is natural that some receptacle should be found for them. Again, the elemental idea that after death the spirit continues to reside in the body, or in some portion of it, as a bone or the skull, explains the philosophy of placing a statue of the dead man beside his grave. The Maori *atua* or ancestral deity deigns to enter his carved wooden image through the incantation of a priest, in order temporarily to deliver oracles. Tiele has shown us that the *nirgalli*, those representations of monsters so common outside the Chaldean palaces, had for their aim to offer alternative dwelling-places to malignant spirits, especially those of diseases.

A striking feature of idolatry is its tendency to revive even under the shadow of purer spiritual ideas. The proneness of the ancient Jews to lapse into the idolatry of the neighbouring races, despite the lofty conception of monotheism which was early grasped by the Semitic consciousness and is still maintained within the wide range of Islam, is paralleled by the modern Brahman return to a practice abhorrent to the ancient Vedic religion, as well as the universal Buddhist adoration of statues and relics of a founder pre-eminent among men for the pure spirituality of his teaching. And even within the range of Christianity itself such fantastic absurdities as winking and weeping statues, and the periodical liquefaction of a saint's blood sixteen centuries old are conceptions in perfect keeping with the devices of an idolatrous priesthood in Polynesia or Central Africa.

See the articles ANIMISM, ANIMALS (WORSHIP OF), FETICHISM, IMAGE-WORSHIP, and RELIGION; the works of Spencer, Waitz, Schultze, Réville, and Girard de Rialle, *[illegible]*; and particularly E. B. Tylor's *Early History of Mankind* (chap. vi.), and *Primitive Culture* (chap. xiv.); and Goblet d'Alviella's admirable study, 'Les Origines de l'Idolâtrie,' in the *Revue de l'Histoire des Religions* (vol. xii. 1885).

**Idria,** a mining-town in the Austrian crown-
of Carniola, celebrated for its quicksilver
(discovered in 1497), is situated 1093 feet
level in a deep, caldron-shaped valley, on
same name, 23 miles W. by S. of
rds of 230 tons of quicksilver are
ly, and about 20 tons of cinnabar
f mercury). Pop. 4284. The
0; about 1000 of the women are
aking.

ical figure in Welsh tradition,
been at once a giant, a prince,
. On the summit of Cader Idris
hshire may be seen his rock-hewn
cient tradition told that any
ho should pass the night upon it
nd next morning either dead, mad,
with supernatural poetic inspiration.
n forms the subject of a fine poem by
as; the gigantic size of the chair is
o in Tennyson's *Geraint and Enid*.

**Idrisi.** See EDRISI.

**Idumæa.** See EDOM.

**Idun,** or IDUNA, the name of a goddess of the northern mythology. She was the daughter of the dwarf Svald; but being received among the Æsir, she became the wife of Bragi. See SCANDINAVIAN MYTHOLOGY.

**Idyll** (Gr. *eidullion*, Lat. *idyllium*, 'a little
mage'), a term generally used to designate a
ecies of poem representing the simple scenes of
oral life. It is, however, an error to suppose
the idyll is exclusively pastoral; certainly
e is no warrant for such a notion in the usage
er of the ancients or the moderns. Of the
ty *Eidyllia* of Theocritus not more than one-half are pastoral in their character. After the use made of the word by Tennyson in his *Idylls of the King*, which are epic in their style and treatment, and romantic and tragic in their incidents, it becomes very difficult to say what may not be called an idyll.

**If,** a rocky island in the Gulf of Marseilles, crowned by a castle, the Château d'If, which was built by Francis I. of France, and subsequently used as a state-prison. Here were confined, amongst others, Mirabeau and the Duke of Orleans (Philip Égalité), not to mention 'Monte Cristo.'

**Ifni,** a small seaport in southern Morocco, 35 miles S. of Aguilon, ceded to Spain in 1883 in fulfilment of a clause in the treaty signed between the two countries so far back as 1860.

**Iggdrasil.** See YGGDRASIL.

**Iglau** (Bohm. *Jihlava*), the second largest town of Moravia, is situated 1703 feet above sea-level, on the river Iglawa, close to the Bohemian boundary, 123 miles NNW. of Vienna by rail. It has some old churches (one founded in 799). Its staple industries have always been the manufacture of cloth and woollen goods; glass and tobacco are also manufactured. It has a large trade in corn, flax, wool, cloth, and timber. Pop. (1880) 12,378. Here on 5th July 1436 the Emperor Sigismund signed the Prague Compactata, after which he was accepted as king by the Bohemians. In the Thirty Years' War it was taken by the Swedes and recaptured by the Imperialists.

**Igloolik,** an island near the east end of the Fury and Hecla Strait in the Arctic Ocean, is the place where Parry passed the winter of 1822-23.

**Ignatieff,** NICOLAUS PAULOVITCH, Russian diplomatist, was the son of General Paul Ignatieff, a favourite officer of Alexander II. He was born at St Petersburg on 29th January 1832, and educated in the corps of pages. In 1856 he exchanged from the military to the diplomatic service. In 1858 he induced China to give up to Russia the Amur province; and in 1860, having been appointed ambassador at Peking, he secured for his country from China the southern portion of the Maritime Province lying east of the Amur. Between the two treaties by which Russia thus gained footing on the Pacific, Ignatieff concluded with Khiva and Bokhara commercial treaties advantageous to his own country. In 1867 he was made ambassador at Constantinople, at which court he had represented Russia since 1864. He there acquired considerable influence over the Sultan and amongst the Turkish statesmen. An ardent Panslavist, he is suspected of having intrigued with the Slav states of the Balkans in the interests of Russia. In the diplomatic proceedings before and after the Russo-Turkish war of 1878 Ignatieff took a principal part as Russia's representative. The treaty of San Stefano was principally his work; and he was greatly incensed when it was decided to submit its conclusions for revision to a European conference at Berlin. After Alexander III. came to the throne Ignatieff was appointed minister of the Imperial Domains, and in 1881 succeeded Prince Loris Melikoff as minister of the Interior. In this capacity he endeavoured to stamp out Nihilism by forcible measures, but unsuccessfully. He was dismissed at the end of the year, apparently because of his Panslavist intrigues, and for having shut his eyes to the persecutions of the Jews.

**Ignatius,** one of the so-called Apostolic Fathers, about whom information is but scanty down to the time of Eusebius, except in so far as may be gained from the much-disputed epistles associated with his name. His birth and education are wrapped in obscurity, but from the letters it may be inferred that he was not born of Christian parents, but was converted in mature life, and that his earlier life had been such as to fill his later years with remorse and give an unusual intensity to his religious convictions. The name is Roman; the second name, Theophoros, is merely a second name and not a title of honour ascribed to the saint. It was often interpreted as 'the God-borne,' as Ignatius was said to be the child our Lord took in his arms (Mark, ix. 36, 37), but this story was unknown in the early centuries. Eusebius is silent about it, and Chrysostom says distinctly that Ignatius had not seen the Lord. Origen makes him the second of the Antiochene bishops, and in Jerome's revision of the *Chronicon* of Eusebius he is stated to have been, with Papias and Polycarp, a disciple of St John. The usual date for his accession is 69 A.D., and of his martyrdom 107, but all that can be said with certainty is that his martyrdom fell about 110. The letters show that he was condemned to the wild beasts at Antioch, and that he was carried to Rome by a maniple of soldiers merely for the execution of his sentence. On the journey he was joined at Smyrna by representatives from the churches of Tralles, Magnesia, and Ephesus. Here he wrote four letters which are extant; three to the churches whose delegates had met him—the Ephesians, the Magnesians, and the Trallians; the fourth, to the church of the Romans, whither he was journeying. The first three are mainly concerned in enforcing lessons of doctrinal truth and ecclesiastical order; the fourth is occupied almost entirely with the thought of his approaching martyrdom. Next from Troas he wrote three letters: the first and second to the churches of Philadelphia and Smyrna, which he had just visited; the third to Polycarp, bishop of the latter. The general topics treated are the same as in the first three, but special charges are laid upon Polycarp to exhort the brethren at Antioch. We next hear of him at Philippi, as we learn from Polycarp's extant reply to the Philippians, who had evidently asked Polycarp for copies of the letters of Ignatius —not improbably the very cause of their preservation. Beyond this point we know nothing more of Ignatius save that at Rome he earned his martyr's crown. The tragic interest of his journey to face his doom in the arena, and the noble and exalted heroism of his enthusiasm as the vision of martyrdom for his Lord opened up before his eyes, left his dying letters a precious heritage to the church and gave an added sanctity to his teaching.

About the close of the 4th century we meet the persistent statement that the relics of Ignatius had been carried from Rome to Antioch, and we find October 17 fixed as the day of his martyrdom. The bones were finally deposited in the Tychæum or Temple of Fortune, which henceforward became known as the Church of Ignatius. His reputation was great, as is evinced by the epistles forged or interpolated in his name; the legendary acts of martyrdom, which give the unhistorical but well-known interview with Trajan; the translation of his letters into Syriac, Coptic, and Armenian—honoured especially by the Monophysites, who fancied they found support in them for their distinctive tenets. And from the close of the 16th century the Jacobite patriarchs of Antioch have regularly assumed the name of Ignatius on their accession to the see.

The Ignatian epistles exist in three different forms or recensions. The *first* of these contains three epistles alone: to Polycarp, to the Ephesians, and to the Romans. It is extant only in a Syriac version. The *second* presents these three epistles in a fuller form, and adds to them four others: to the Smyrneans, Magnesians, Philadelphians, and Trallians. Besides the original Greek this form is found in Latin, Armenian, Syriac, and Coptic translations, although only fragmentarily in the last two. The *third* contains the seven epistles already mentioned in a still longer form, together with six others—a letter from Mary of Cassobola to Ignatius, and letters from Ignatius to Mary of Cassobola, to the Tarsians, the Antiochenes, to Hero, and to the Philippians. This recension is extant both in the Greek and in a Latin translation. These three it is now usual to call the *Short*, *Middle*, and *Long* recensions. As will be seen, of the twelve Ignatian epistles (excluding that of Mary to Ignatius) three occur in three different forms, four in two forms, and the remaining five in one form only. The Long recension is now universally condemned as spurious. More serious is the dispute between the remaining two, which are often spoken of, from their editors, as the Curetonian (*Short*) and the Vossian (*Middle*) versions. The Curetonian long held the field, but the genuineness of the Vossian letters is now the prevailing belief, and is every day gaining ground. Bishop Lightfoot began by believing in the Curetonian form, but gradually found that the position demanded too much ingenuity from the Ignatian forger, and at length, influenced greatly by Zahn, found himself compelled to believe in the seven Vossian epistles as representing the genuine Ignatius. Indeed the priority and substantial genuineness of the Vossian letters may be said to be proved, in so far as any question of the kind can be proved, by Lightfoot's work; and with this conclusion one of the main buttresses of Baur's scheme of the formation of the Christian canon and of early Christian history generally falls to the ground.

The Short Form, represented only by a Syriac vers
was first published by the Rev. W. Cureton in 1845, f
MSS. recently brought to the British Museum fr
Nitrian desert. Not only are the epistles
number, but shorter and more abrupt. Thei
believe the Greek form an expansion and
the lost Greek originals of these Syria
their opponents think the Syriac an a
Greek.

The Middle Form was first publ
version (made perhaps by Robert Gr
(Oxford, 1644), from two MSS. dis
the original Greek, by Isaac Vos
from a Medicean MS., the epistle
excepted, which was first publish
1689). The Armenian version ap
ople in 1783. These may now be
confidence as the seven epistles of Ig
Eusebius, which were translated into
his time, and of which the Curetonian
an extract.

The Long form in its Latin version
Faber Stapulensis (Paris, 1498); in the
Valentinus Paceus (Dillingæ, 1557). These
supposed to have been interpolated and extende
pseudo-Ignatius in the later half of the 4th century.

The chief differences in substance of these th
forms of the Ignatian epistles are these: the Cur
tonian text contains no quotation from the Old
Testament, and very few from the New, while the Vossian contains a considerable number of quotations, and the Long a large number. Again, the last also contains many allusions to religious institutions not in existence in a mature state before the 4th century, as well as plagiarisms from preceding writers and perceptible differences in doctrinal teaching. There is a tendency to maintain the supremacy of the Father, and to make the Son's agency dependent. Indeed, many passages savour distinctly of Apollinarianism, yet the general bearing of the language leans faintly to the Arian side. The whole might well be an eirenicon

palmed off by a pious fraud upon the name of a venerated primitive father of the church. The style and expression throughout drive us to the conviction that the six additional letters come from the same hand which interpolated the seven.

Again, the Vossian letters are found to be distinctly antagonistic to Docetism. Indeed, a characteristic note of Ignatian theology throughout is the accentuation of the twofold nature of Christ—his deity and his humanity. The advocacy of the episcopal office appears definitely in the Short no less than the Middle form; and the abridgment must have been made rather for purposes of edification or practical convenience rather than for Monophysite reasons, as C. Wordsworth maintained, or for any other doctrinal purpose. In short the abridgment theory is much more rational and easy than the expansion theory, and if we are to accept the latter we must maintain, says Lightfoot, that the pseudo-Ignatius was a prodigy of minute observation, of subtle insight, of imitative skill, of laborious care, which is probably without a parallel in the history of literary forgeries, and which assuredly was an utter impossibility among the Christians of the 2d and 3d centuries.

The prominence and authority of the episcopal office in the Ignatian epistles has proved a grave stumbling-block to many scholars. It is certainly sufficiently clear throughout, yet it is merely as the embodiment of the idea of order and the guarantee of unity within the church. It is not upheld exclusively as against other forms, while all tinge of sacerdotalism is absent, as well as such an argument as that in Irenæus, who lays stress on the apostolic succession *as a security for its faithful* transmission. Nor is it autocratic by any means, while its spread is not yet uniform throughout Christendom, as at Philippi, for example. Evidence a localised episcopate within the Gentile churches bsent, and nowhere is there any trace of the of a distinct diocese, while there is no to any developed ritual of public service. e epistles are full of the necessity of bishops, which is alone wanting in ddressed to the Romans, who be inferred had not yet adopted ient which Ignatius elsewhere h warmth.

*Syriac Version of the Epistles of* 5), and his *Corpus Ignatianum* in his support by Bunsen, A. is, and those against his theory ld, who denied the authenticity of al blow to Cureton's theory was learned work of Zahn, *Ignatius* 3), which won over Lipsius, and now ts most formidable champion being Lightfoot, whose work, *The Apostolic II., S. Ignatius and S. Polycarp* (2d 1889), contains all materials necessary for plete study of the question, and is a masterpiece found erudition and conclusive argument hardly equalled in the whole range of English or German rship.

**Ignatius' Beans,** SAINT, the seeds of the *natia amara*, formerly *Strychnos Ignatii*, a tree of the natural order Loganiaceæ, and nearly allied to that which produces *Nux vomica* (q.v.), a native of Cochin-China and of the Philippine Islands. The fruit is of the size of a large pear, and contains about twenty brownish seeds, of about the size of olives, rounded on one side, and somewhat angular on the other. They contain *strychnia*, but no brucia, and their medicinal uses are similar to those of *nux vomica*.

**Ignatius Loyola.** See LOYOLA.

**Igneous Rocks** are those which have been erupted from the heated interior of the earth: hence they are also termed *eruptive rocks*. Petrologically they may be grouped under two heads—*crystalline* and *fragmental*. The crystalline division includes many rocks which are rather vitreous or glassy than crystalline, while a large number are composed partly of crystalline and partly of non-crystalline materials. No quite satisfactory classification of the 'crystalline' igneous rocks has as yet been possible, perhaps the most convenient being that which is based on the nature of the principal rock-forming minerals. Thus, those in which orthoclase (see FELSPAR) is a dominant ingredient are grouped together as *Orthoclase rocks*. In another large class plagioclase-felspars play a principal part, and thus we have the *Plagioclase rocks;* and so in like manner *Nepheline* and *Leucite* rocks, and *Olivine* and *Serpentine* rocks.

(1) *Orthoclase Rocks.*—Some of these rocks contain much free silica (Quartz, q.v.), while others contain little or none. They are thus divided into two groups—*Quartziferous* and *Quartzless*. Under the first group come *Granite*, *Quartz-porphyry*, and *Liparite*, while under the second are ranged *Syenite*, *Orthoclase-porphyry*, and *Trachyte*. Some of these rocks are holocrystalline—i.e. composed entirely of crystalline ingredients, as granite and syenite; others, such as liparite and trachyte, are only semi-crystalline—they contain in addition to crystalline constituents a larger or smaller proportion of non-differentiated mineral matter. *Obsidian* and *Pitchstone* are vitreous species of orthoclase rocks which consist almost entirely of volcanic glass. Other kinds of orthoclase rocks have been recognised by petrologists, but those mentioned are the most important.

(2) *Plagioclase Rocks.*—Most of the rocks in this division are distinguished by their basic character—that is to say, they contain generally less silica than orthoclase rocks. The most important species are *Diorite* (a crystalline granular aggregate of plagioclase and hornblende), *Andesite*, *Porphyrite*, *Basalt*, and *Gabbro*. The holocrystalline character is seldom met with in this division; it occurs, however, in diorite and gabbro. The other species mentioned usually contain some admixture of non-differentiated mineral matter. Vitreous varieties also occur in this division. See BASALT.

(3) *Nepheline and Leucite Rocks.*—The rocks included under this head closely resemble the basalt rocks of the preceding division, plagioclase being substituted in whole or in part by nepheline or leucite or by both. See BASALT.

(4) *Olivine and Serpentine Rocks.*—These are generally rather basic rocks. The olivine rocks proper, or *Peridotites*, as they are called, contain olivine as their principal constituent. They often show more or less alteration, the olivine being replaced in whole or in part by Serpentine. Some olivine rocks, indeed, have been completely altered into serpentine.

The *fragmental* igneous rocks consist of the loose ejectamenta which have been erupted from volcanic orifices. These rocks are frequently consolidated, and when fine-grained it is sometimes difficult without the help of the microscope to distinguish them from compact crystalline igneous rocks. Some account of these rocks will be found under AGGLOMERATE, TUFF, VOLCANO.

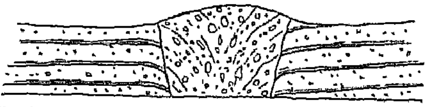


Fig. 1.—Neck filled with Fragmental Igneous Rock.

Igneous rocks, when looked at from the point of view of the student of structural geology, are classified in an altogether different way. It is not only necessary to know the petrological character of a rock—we must discover something of its history. Was it extruded at the surface like the ejecta of modern volcanoes, or did it cool and consolidate below ground? Thus two kinds of igneous or eruptive rocks are recognised by geologists: (1) *Volcanic rocks*, consisting of lavas, tuffs, &c., which have been ejected at the surface, either upon the land or under water; (2) *Plutonic* or *Hypogene rocks*, which, whether consisting of crystalline or fragmental materials, have not been so extruded, but are now exposed owing to the denudation of rock-masses underneath which they were formerly concealed. The volcanic rocks are often termed *contemporaneous*—i.e. they belong to the same geological age as the strata with which they are *interbedded*. On the other hand, the *plutonic* rocks are described as *intrusive* or *subsequent*, because they have been *intruded* amongst, and therefore must be *subsequent* in date to the rocks with which they are in contact.

(1) *Contemporaneous Igneous Rocks.*—These consist of crystalline (lava-flows) and fragmental rocks (tuffs, &c.), and are simply the products of former volcanic action. They are met with at all geological horizons from the oldest down to the most recent period. Sometimes they indicate the former existence of small isolated 'puys' (see VOLCANO), from which it may be only a single eruption took place; at other times they are obviously the products of much more powerful and long-continued volcanic action. Many of the hill-ranges of central Scotland (for example, Sidlaws, Ochils, &c.) are built up of successive lava-flows with associated tuffs, which have been ejected from vents in the manner of modern volcanic eruptions. In some regions, however, there occur vast successions of lava-flows, covering immense areas, which do not appear to have been erupted from isolated vents, but are believed to have welled up along the line of great fissures, and to have poured in wide floods over the surface, so as eventually to form extensive plains or plateaus. The rocks of such 'fissure-eruptions' consist usually of basalt, with basalt-tuff or Palagonite. The basalt plateaus of the western territories of North America, of Iceland and the Faroes, of the Deccan (India), and of Abyssinia are good examples; while in Antrim and in many of the western islands of Scotland fragments of similar plateaus may be studied.

An interbedded or *contemporaneous* lava-form rock may often be distinguished from an *intrusive* sheet of crystalline igneous rock by noting that the beds which immediately overlie it show no trace of having been subjected to the action of heat. The upper part of the lava-form rock is not infrequently scoriaceous or amygdaloidal (see AMYGDALOID) in character, and fragments of this crust may occasionally be found in the overlying beds if these chance to be of aqueous origin.

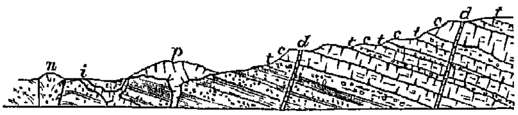


Fig. 2.—Contemporaneous and Intrusive Igneous Rocks: c, c, contemporaneous trap-rocks; t, t, contemporaneous fragmental igneous rocks; i, p, n, d, intrusive igneous rocks.

(2) *Intrusive Igneous Rocks.*—These rocks are likewise met with under two forms—*crystalline* and *fragmental*. The *fragmental* intrusive rocks are found only in connection with old volcanic vents. These latter, in countries where volcanic action has been long extinct, no longer exist as crateriform hollows. The upper parts of the cones have all been swept away, and only the stumps remain. These stumps are known as *necks*, by which is understood a more or less cylindrical funnel or volcanic vent filled up either with fragmental or crystalline rock or with both. Such necks vary in diameter from a few yards up to several hundred feet; sometimes they occur upon a line of Dislocation (q.v.) or fault; at other times they have no such connection. The necks now described are probably the relics of comparatively small volcanoes like the puys of Auvergne and the Eifel. Now and again, however, as in some of the hill-ranges of central Scotland, necks of a larger size are met with. These vary from 100 yards or so up to a mile or more in diameter, and are usually plugged up with crystalline igneous rock, although fragmental rock also is occasionally present. Such necks seem to be the stumps of great volcanic vents, from which the lava-form and fragmental igneous rocks of the surrounding neighbourhood were ejected. Good examples occur in the ranges of the Sidlaws, the Ochils, the Braids, &c. *Bosses* is the term applied to irregular-shaped masses of crystalline igneous rocks, which appear to be for the most part of deeper-seated origin than those of the necks just referred to. The rocks of these bosses are usually more or less coarsely crystalline, and often have a granitoid aspect, such as granite, syenite, gabbro, &c. Bosses usually cover a considerably wider area than necks, and it has been conjectured that they are merely the most deeply seated *portions of ancient volcanoes—the reservoirs from* which molten matter was pumped up to the surface. *Intrusive Sheets* are masses of crystalline igneous rock which have been eru[illegible] planes of bedding of pre-existing s[illegible] never scoriaceous or slaggy, an[illegible] markedly crystalline in texture, [illegible] the sheet is thick. Their intrus[illegible] often betrayed by the baked appear[illegible] which overlie them; by the fact [illegible] keep quite to one and the same [illegible] times break across the overlying be[illegible] their course along a somewhat higher [illegible] by the veins and protrusions which not [illegible] proceed from them. *Dykes* are vertical wall-li[illegible] sheets of igneous rock, which may vary in thickness from a foot or so up to 30 yards or more. The[illegible] often run persistently in one direction for many miles. Occasionally they divide into two or more branches, and now and again they send out veins into the surrounding strata. The rock most frequently met with in such dykes is basalt. Sometimes dykes rise along the lines of faults, but this is by no means general. *Veins* is the term applied to the more irregular, winding, branching, and tortuous smaller intrusions of igneous rock. They may consist of any kind of crystalline rock. Dykes and veins are frequently found proceeding in all directions from bosses, as in the case of granitic masses. From the smaller puy-like necks also veins and dykes have occasionally been injected into the surrounding rocks, while these and

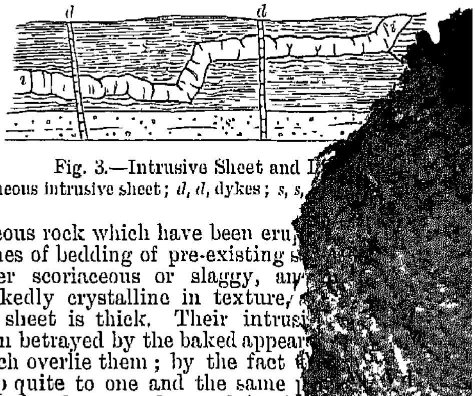


Fig. 3.—Intrusive Sheet and [illegible]
i, igneous intrusive sheet; d, d, dykes; s, s, [illegible]

extensive sheets may often be traced proceeding from the larger kinds of necks. The rocks surrounding bosses, and traversed by veins, are often highly metamorphosed. See METAMORPHISM.

**Ignis Fatuus** (Lat. *ignis*, 'fire,' *fatuus*, 'foolish') is a luminous appearance of uncertain nature which is occasionally seen in marshy places and churchyards. The phenomenon has been frequently described, but it has been observed so rarely in favourable circumstances by scientific men that there is no satisfactory explanation. The light usually appears in autumn evenings shortly after sunset; it is common in the north of Germany, in Italy, in the south and north-west of England, and on the west of Scotland, but it has been noticed in many other countries.

Descriptions of ignes fatui vary so much that several different phenomena have evidently been included under the name. The light usually resembles a flame, and is often mistaken at first for the light of a lantern, but seen more closely the colour appears as bluish, reddish, greenish or yellowish, merging into purple, but never a clear white. Some observers describe the flame as fixed in position, shining steadily either close to the ground or a few feet above it, and illuminating the surrounding reeds and grass. Others have seen it in motion bounding rapidly over the country, and sometimes rising high in the air. The light has been seen to divide repeatedly into several smaller flames, which describe complicated movements, advancing, retiring, and combining. The moving light is said to recede from an observer who approaches it, but to follow him if he retires from it.

Some supposed appearances of the ignis fatuus have been proved to be the lights of distant houses seen through trees; others are almost certainly due
uminous insects, such as the glow-worm, or to
phorescence of decaying vegetable matter.
Fire (q.v.) has also been confounded with
etting all these possible cases aside, both
ioving ignes fatui have been proved to
pectrum of the light has never been
is the writer can ascertain. It is
been ignited by the flame, and
e must be at least two similar
rent nature. List in north
hand through the luminous
no warmth; near the same
te Knorr held the metal tip of
he flame of a fixed ignis fatuus
ot himself touch on account of
arter of an hour, but the metal
n the former instance a puff of
he flame, and a very slight
d when it reappeared; in the
t of air only made it flicker
ght breath produced no effect.
as perceptible.

mon hypothesis that ignis fatuus is the
of burning marsh-gas, $CH_4$, is untenable, for
ugh this gas is produced abundantly in many
hy places it cannot ignite spontaneously. The more plausible suggestion that phosphuretted hydrogen, $PH_3$, which is spontaneously inflammable, might be produced in churchyards or marshes where there is decaying animal matter, does not account for the effect observed by the German physicists, since no gas can burn without giving out heat, and that particular gas has a very penetrating and characteristic smell. Nor could a burning gas, except on the most extravagant assumptions, bound over the country like a ball of fire for half an hour at a time. The early supposition of a phosphorescent vapour is more reasonable, although excepting that of free phosphorus, which could not occur in nature, no such vapour is known to exist. The phenomenon was undoubtedly more common a century ago than it is now, and its disappearance in many localities may be directly traced to the draining of fens and marshes.

Popular names—e.g. Will-o'-the-Wisp, Jack-a-Lantern, Spunkie, &c.—abound in folklore, and are connected with many stories of travellers mistaking the marsh lights for a cottage window, and being decoyed into dangerous places, often with fatal results. A German legend identifies the will-o'-the-wisp with the soul of an unbaptised infant; an Irish, with a soul broke out of Purgatory. For the folklore of the subject, see *Notes and Queries*, passim.

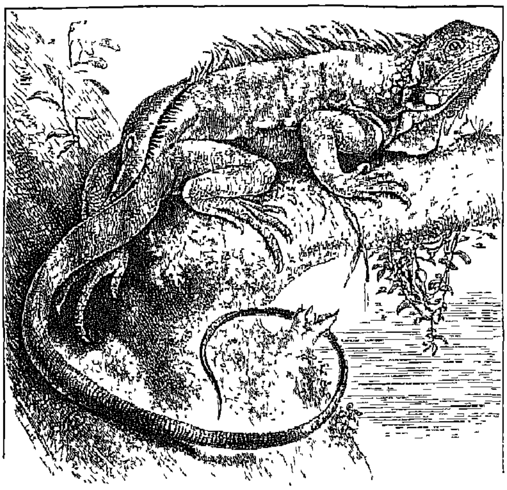
**Ignoramus** (Lat., 'we do not know'), the word formerly written by a grand-jury on the back of an indictment, meaning that they rejected it. The word is now used most commonly as a synonym for a blockhead.

**Ignorance** (*Ignorantia juris*) is held in law to be no excuse for any breach of contract or duty, nor for crime or other offence. It is absolutely necessary to start with this maxim, otherwise it would be quite impossible to administer the law; for if once a contrary maxim were allowed it would not only be a premium to ignorance, but would lead to endless and abortive inquiries into the interior of a man's mind. Ignorance of a fact, however, is a different thing. Another kindred maxim of the law is that every man intends the consequences of his own act. Thus, if he shoot at or give poison to a person it is presumed that he intended to kill such person. So, if he leave a trap-door open in a street or thoroughfare it is held that he intended people to fall into it and be injured. There is, however, a doctrine called *bona fides*, which, in the case of petty offences punishable by justices, often tempers the strict and rigid application of the maxim, *ignorantia juris neminem excusat*; and even in crimes a judge always takes into consideration, when passing judgment, whether the prisoner or defendant was an ignorant or intelligent person.—In Catholic theology, a man is never excused for sin, whether of omission or of commission, on the plea of ignorance which he can be fairly expected to overcome, of 'vincible' or wilful ignorance; whereas 'invincible' ignorance, which a man could not help or abate, altogether excuses from guilt.

**Ignorantines,** a religious congregation of men in the Roman Catholic Church, devoted to the gratuitous instruction of poor children, now better known as the Brothers of Christian Schools. See SCHOOLS.

**Igualada,** a town of Spain, 32 miles NW. of Barcelona, on the west side of Mount Montserrat. It carries on manufactures of cotton and woollen goods and firearms. Pop. 11,900.

**Iguana,** a genus typical of the Iguanidæ, a family of thick-tongued lizards representing in the New World the Agamidæ of the Old. The family comprises fifty-six genera, most of which are found in tropical America. They are slender and lizard-like in form, have distinct eyelids, the tympanic membrane usually free, the tail long and compressed, the toes free, five on each limb, and ending in a sharp claw. They are arboreal in habit, and feed chiefly on leaves and fruits, but will also eat insects. The genus Iguana includes five species, found in the West Indies and South America, and all characterised by a pyramidal head, a pouch of skin under the throat, and an upright comb of pointed teeth extending along the back from the neck to the tip of the tail. The best known is the Common or Green Iguana (*I. tuberculatus*), which has a very large pouch, is predominantly of a beautiful green colour, and grows to a length of from 3 to 5 feet. This iguana lives usually in trees near a stream, climbing with great ease, and moving rapidly along the branches, but taking readily to the water, where it swims by means of its tail.



Common Iguana (*Iguana tuberculatus*).

Its flesh is white and tender, and is much esteemed for food. It is sometimes caught by noosed cords, sometimes tracked to its burrow by dogs trained for the purpose. The eggs are about the size of those of a pigeon, but have no hard shell, and are laid in the sand. They also are used as food. Other species of iguana and their eggs are eaten by those, as Darwin says, 'whose stomachs soar above all prejudices.' Other important genera are Anolis; Cyclura, one species of which, *C. lophoma*, is called the 'great Iguana' of Jamaica; Amblyrhynchus, the marine lizard; Phrynosoma, the 'horned toads;' and the Basilisks (q.v.). See LIZARD; and Boulenger, *Brit. Mus. Cat. of Lizards* (2d ed. Lond. 1885-87).

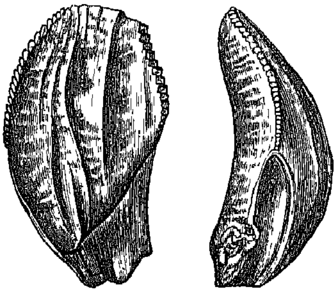


Fig. 1.—Front and side view of a Tooth of the lower jaw of the Iguanodon, about two-thirds natural size.

**Iguan'odon** (Iguana, and Gr. *odous*, 'tooth'), a genus of remarkable gigantic dinosaurian reptiles, more abundant in the Wealden beds of Kent, Sussex, and the Isle of Wight than any other genus of associated saurians. Their singular structure, differing in many important particulars from any known reptile, long caused great diversity of opinion as to their true position. Dr Mantell, their original discoverer and learned expounder (1822), first knew of their existence from some enormous bones, which, notwithstanding their colossal size, he considered reptilian. A large tooth next turned up, whose smooth-worn crown attested its having belonged to a herbivorous animal. Numerous other specimens of teeth were in process of time discovered, and Dr Mantell found that they corresponded in a remarkable manner with the teeth of the small American lizard, the iguana, although they exhibited very striking and important differences. The first guesses as to the creature's size, founded on fragmentary materials, varied vastly; Mantell suggesting a length of 70 feet, Owen of 28. An extraordinary recent find of iguanodons has simplified this and other questions as to the structure. In 1878 there were found at Bernissart, in Belgium, between Mons and Tournai, the remains of about twenty-three specimens, belonging to two well-marked species; only two other species having till then been proposed. In the complete skeleton set up at Brussels from these materials the height is 14 feet 2 inches; the horizontal length of the body in a half-standing attitude, 23 feet.

The structure of the skeleton is very remarkable. The front parts of both upper and lower jaws were without teeth, and suggest a hollow, beak-like arrangement; possibly the creature had a long prehensile tongue. In many respects there are striking resemblances between the structure of the ornithopod Dinosaurians (of which the Iguanodontidæ are a family) and that of birds. The vertebral column had joints slightly concave on both surfaces, yet had lofty neural arches; and the sacrum was composed of five anchylosed joints, a structure found in no other reptile. The two fore-legs were small; the hinder limbs were long and strong, raising the body some distance from the ground. The leg terminated in a three-toed foot, which produced the enormous tridactyle impressions on the argillaceous Wealden beds that were for some time considered to be the footprints of huge birds. The teeth of the iguanodon, while bearing

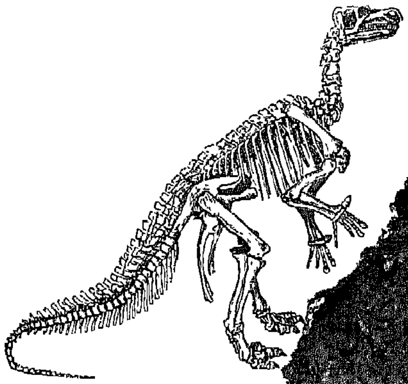


Fig. 2.—Skeleton of Igua

a general resemblance to those of much more complicated both in and internal structure than in an reptile. In all other known reptile flat teeth are always sharp-edged to cut off the plants on which th worn crowns in this animal show th don thoroughly triturated its food befor ing it.

**Iguvium.** See GUBBIO.

**Ihre,** JOHAN, an eminent Swedish scholar of Scottish extraction, was born at Lund in 1707, and educated at the university of Upsala, where he acquired a great reputation and carried highest honours. He subsequently tra France and England, was appointed on to Sweden under-librarian to Sciences, and rose through a va professor of Belles-lettres an (1748). He died in 1780. In his *Glossarium Suiogothicum* work of great talent and eru a product of the pre-sc respects be regarded as philology. It was issue which gave Ihre 10,000 dollars to execute it. Another work of lasting value is the *Svenskt Dialect-Lexicon* (1766).

**Ilchester,** a decayed village of Somersetshire, on the Yeo, 5 miles NW. of Yeovil. Supposed to be the *Ischalis* of Ptolemy, it was the principal station of the Romans in this region, and was a flourishing town in Saxon times. Numerous Roman remains have been found here. Ilchester is the birthplace of Roger Bacon. Till 1832 it returned two members. Pop. 683.

**Île-de-France,** one of the old provinces of France, having Paris as its capital, and now mostly comprised in the departments of Seine, Seine-et-Oise, Aisne, Seine-et-Marne, Somme, and Oise. In the middle of the 9th century it was made a dukedom, and became one of the four constituent fiefs of the French *monarchy*. The second duke, Odo, commonly called Count of Paris, was crowned king of France in 888. His successors contended for some years for the throne of France; one of them, Hugh Capet, founded in 987 the Capetian dynasty (see FRANCE). Île-de-France was formerly the name of Mauritius (q.v.).

**Iletzk,** a town in the Russian government of Orenburg, near the confluence of the Ilek with the Ural. Pop. 5769. Close by is the richest salt-bed in Russia, yielding close upon 21,700 tons of salt annually. It was discovered by Pallas in 1760, and visited by Murchison in 1850.

**Ileum.** See DIGESTION.

**Ileus,** or ILIAC PASSION. See COLIC.

**Ilex,** a tree often named in the Latin classics, the Evergreen Oak or Holm Oak (*Quercus Ilex*). See OAK. It is a native of most parts of the south of Europe and of the north of Africa, often attaining large dimensions, as it sometimes does where planted in Britain. It grows in general singly or [illegible] small groups, and loves the vicinity of the sea. [illegible] leaves are ovate-oblong, acute, leathery, hoary [illegible]th; but they vary much in some respects, [illegible] the size of a sloe-leaf to that of a beech, and [illegible] very spiny at the edge to perfect even- [illegible] bark is very astringent, and is employed [illegible] hides in the countries to which the tree [illegible] Its wood is very hard and heavy, and useful, particularly for axles, [illegible] and whatever is to be subjected to [illegible] The acorns are of various quality, [illegible] -er, and sometimes sweet and eat- [illegible] In botany Ilex is the generic name [illegible] (q.v.).

[illegible], a watering-place of England, is [illegible] on the picturesque rocky coast of [illegible] on a cove or inlet of the Bristol [illegible] es NNW. of Barnstaple (15 by a [illegible]). Its air 'combines the soft warmth [illegible] on with the bracing freshness of the [illegible] mountains' (Charles Kingsley). This and its fine coast-scenery and its admirable sea-bathing annually attract large numbers of visitors. On the north side of the (good) harbour there is a lighthouse, the light, 127 feet above high-water, being visible for 10 miles. Although having now nothing more than a little coasting trade and fishing, Ilfracombe was in the 14th century a port of some consequence, and contributed six vessels to the English fleet for the siege of Calais. Pop. (1851) 2919; (1881) 6255.

**Ilhavo,** a town in the Portuguese province of Beira, 40 miles S. of Oporto. Two miles distant is the celebrated glass and porcelain factory, Vista Alegre. Pop. 8623.

**Ili.** See KULJI.

**Ilicin,** the bitter principle derived from Holly (q.v.).

**Ilissus.** See ATHENS, and ATTICA.

**Ilium.** See TROY; and for Iliad, see HOMER.

**Ilk** (O.E. *ylk* 'the same'), an old form found both in English and Scotch meaning the same. Thus, Chaucer has 'this ilk worthe knight' and 'that ilk man.' It is still not unknown in Scotland in connection with family designations; thus, 'Kinloch of that ilk' means 'Kinloch of the estate' of that same name, or 'Kinloch of Kinloch.' 'Of that ilk' is however constantly but absurdly and ignorantly used to mean 'of that description,' as in 'carpetbaggers and politicians of that ilk.'

**Ilkeston,** a market-town of Derbyshire, near the Erewash River, 9 miles ENE. of Derby, and 20 S. of Chesterfield. It enjoys repute from its alkaline spring and baths (opened in 1830). The parish church, with a lofty pinnacled tower, has interesting Norman and Early English features. The town-hall was built in 1868. Ilkeston has manufactures of hosiery, lace, silk, and earthenware, with coal and iron mines in the vicinity. In 1251 a charter for holding a market and fair here was granted to Hugh Fitz-Ralph; and in 1887 Ilkeston was incorporated as a municipal borough. Pop. (1861) 3330; (1881) 14,122; (1889) 19,500.

**Ilkley,** a watering-place in the West Riding of Yorkshire, on the Wharfe, among heathery hills, 13 miles NNW. of Bradford and 16 NW. of Leeds by a branch-line (1865). Since 1846 it has become the seat of several hydropathic establishments—Ilkley Wells House, Ben-Rhydding (q.v.), &c. It occupies the site of a Roman station, and in the churchyard are three curious Saxon crosses; whilst Bolton Abbey (q.v.) is 5 miles north-west. Pop. (1851) 811; (1881) 4736.

**Ill,** a river of Alsace, rising to the south-west of Basel, and flowing 127 miles north-north-eastward, till it falls into the Rhine 9 miles below Strasburg. It is navigable over nearly one-half of its course.

**Ille-et-Vilaine,** a maritime French department, formed out of the north-eastern portion of the old province of Brittany. Area, 2596 sq. m.; pop. (1872) 589,532; (1886) 621,384, mostly of Celtic race. It is watered chiefly by the Vilaine and its tributary the Ille, which unite near Rennes, the capital of the department. Ille-et-Vilaine consists of a granite plateau traversed by ranges of low hills. It is agricultural, cultivation having been greatly improved during recent years. The cider of this district is the best in France; the butter of Rennes is celebrated; the horses of the department are noted for their endurance, and are in great request for the army; and bee-keeping is prosecuted. Iron is mined; slates are quarried; and salt is extracted. The department is divided into six arrondissements—Rennes, Fougères, Montfort, St Malo, Vitré, and Rédon. St Malo is the principal seaport.

**Illegitimacy,** by the laws of England, debars a child from the inheritance of the father, unless express provision be made by will (see BASTARD). It was even held by Mr Justice Chitty (Chancery Division, July 1889) that the term 'children' in a will does not comprise illegitimate issue, if the wording otherwise is not such as obviously meaning to include them.

The whole subject of illegitimacy forms one of the most difficult of the social problems; and there is no branch of social science in which there is such deficiency of literature. And yet its importance is sufficiently evidenced by the fact that 40,730 illegitimate children were born in England and Wales, and 10,380 in Scotland, in one year. In 1888 the illegitimate births registered in England amounted to 4·6 per cent. of the total births, and to 1·4 per 1000 living persons. The birth-rate of that year was the lowest in England since the present system of registration began; but it is noticeable that, while the marriage-rate, and consequently the legitimate birth-rate, has declined steadily for some years, the illegitimate birth-rate has also steadily declined. From 1841 to 1859 the proportion of illegitimate births to the total number registered ranged from 6·3 to 7 per cent.; in the ten years from 1878 to 1887 the average was 4·8 per cent.; in 1888 the proportion was 4·6 per cent. The decline is very striking, because, in the period first mentioned, the rate fluctuated between 6 and 7 per cent. with a remarkable uniformity. In the year 1845, 70 out of every 1000 births registered in England and Wales were illegitimate; in 1888 only 46 out of every 1000. Illegitimacy was greatest in the following districts, the figures here given being the illegitimate births in every 1000 births registered: Norfolk, 74; Herefordshire, 85; Shropshire, 80; Cumberland, 78; and North Wales, 73. Middlesex (extra-metropolitan) compares favourably, with 34; Yorkshire shows for West Riding 49, East Riding, 56, and North Riding, 62; and the great industrial counties come out with Durham, 40; Northumberland, 49; Lancashire, 44; Derbyshire, 43; Warwickshire, 42. The marriage-rate is proportionately low. Thus, while the average marriage-rate in England and Wales in 1888 was 14·2 per 1000 persons, the marriage-rate of Hereford was 11·5; Shropshire, 11·4; Norfolk, 13·4; Cumberland, 12·6; and North Wales, 11·6. In comparing with the returns of past years we find many fluctuations in the counties; but, generally speaking, the highest rates of illegitimacy in the least densely populated districts. Unfortunately we cannot derive from this fact any conclusion referring to the education or prudential habits of the people, for in Scotland, where education is general, and thrift national, the rate of illegitimacy is notoriously high. And, as regards morals, it should be remembered that a high percentage of illegitimacy may mean that there is no prostitution.

In the year 1887 there were 10,380 illegitimates registered in Scotland out of a total of 124,418 births, but in 1866 there were 11,673 out of 113,667. This marks a considerable improvement, and in fact during the twenty years 1879–88 there was a steady, although not a continuous decline in the rate. The rate for 1888—8·34 per cent.—was slightly higher than that of the previous year; that of 1889 was only 7·85. The following detailed figures are based on the returns for 1888. In the principal towns the rate was as follows: Glasgow, 8·3; Edinburgh, 8·5; Dundee, 10·3; Aberdeen, 10·3; Greenock, 5·3; Leith, 6·6; and Paisley, 6·3 illegitimates out of every 100 registered. The lowest proportion in urban Scotland was in Glasgow—landward and suburban district, 4·3. The highest rural proportion was in Wigtownshire, with 18·2; and the lowest rural proportion was in Kinross-shire, with .4. Next to Wigtownshire for illegitimacy come Banffshire, with 16·8; Kirkcudbright, with 15·7; Elginshire, with 15·2; Dumfriesshire, with 13·9; Aberdeenshire, with 13·2; Kincardineshire, with 12·4; Roxburghshire, with 11·2; and Berwickshire, with 11·1 per cent. The average is brought down by the low rates in the shires of Kinross, Ross and Cromarty, Dumbarton, Renfrew, Fife, Clackmannan, Stirling, Bute, Lanark, and Linlithgow, which range between 4 and 6·8 per cent. The other counties range about the average for all Scotland, with the exception of Shetland, which shows the comparatively low rate of only 4·8 illegitimates in every 100 births. (In 1889 Shetland was the lowest country, with 4; Kinross having 6·7; Wigtown had 17·7 per cent.) What is called the insular-rural districts had an average of 6·2. The comparison for 1888 may be otherwise summed up thus: 1 child in every 12 born throughout Scotland was illegitimate; but in the principal towns the proportion was 1 in 13; in the large towns, 1 in 15; in the small towns, 1 in 12; in the mainland-rural districts, 1 in 10; and in the insular-rural districts, 1 in 16. The tendency to illegitimacy in Scotland is greater in the north-eastern and southern rural districts than in the south-western mining and manufacturing districts—which is much the same distinction as we observed in England. Only, in no part of England are the figures so deplorable as in Scotland. Various theories have been advanced to account for this, but it is doubtful if the whole solution has yet been found. The following may at anyrate be instanced as among the probable causes of the prevalence of illegitimacy in Scotland: a national caution, which deters from early and improvident marriages; the laxity of the marriage-laws in respect of the subsequent legitimation of children born out of wedlock; and the herding together of farm-labourers in bothies and farm-buildings. It is to be noted, also, that a large proportion of the illegitimacy can hardly be ascribed to vice, seeing that the parents often live together and rear their families just as if they were legally married, and as, perhaps, many of them will be some day. For this curious practice no doubt the former high proclamation fees may have been to some extent responsible.

In Ireland we find a very different state of affairs. There, in 1888, of 106,433 births registered only 3124 or 2·9 per cent. were illegitimate. Since 1884 the *percentage has ranged between 2·7 and 2·9.* This is the average for the whole island, but in Ulster the percentage was 4·4; in Leinster, 2·5; in Munster, 2·2; and in Connaught as low as 0·7.
Dublin county was chargeable with nearly
tenth, Londonderry county with about a
tenth, and Antrim with about one-fifth
whole. The marriage-rate in Ireland is
low, being only 4·20 per 1000 of the pop
against 14·1 in England, and 12·4
Poverty may explain the low mar
it is noticeable that of the 78,684 e
year over 80 per cent. were bet
thirty-five years old—that is, of
age. The infrequency of bast
only be ascribed to the chastity
marriage, and the wholesome
church.

To turn now to British colo
some interesting figures; but
bear in mind that birth-rates,
based upon a comparison with t
are somewhat misleading where
in an abnormal condition.
colonies the males largely ex
there must necessarily be an
proportion of child-bearing wom
illegitimate births in Victoria numbe
1 in every 21 births registered. This rate
a small increase since 1880, when the rate
in 27. The mean for fifteen years was 4·25
cent. of the total births, but the total for 1887
4·78 *per cent. of the births. As regards the other* Australasian colonies, illegitimacy is most rife in New South Wales, where it was (1886) 4·65; next in Queensland (1886), 3·97; next in Tasmania (1887), 3·40; and next in New Zealand (1886), *3·12 to every 100 children born. These figures* are remarkably low, but then we must remember that the populations are not yet in a normal condition, and also that the statistics of illegitimacy for many reasons never reveal the whole truth.

This fact must be borne in mind in considering the following table of the proportion of illegitimacy in all the countries of the world for which figures are available. In each case the latest return has been taken :

| | Year. | Per cent. of illegitimates to total births. |
|---|---|---|
| England and Wales | 1888 | 4 6 |
| Scotland | 1887 | 8·34 |
| Ireland | 1888 | 2·9 |
| Austria (average) | 1887 | 14·80 |
| Carinthia | | 45·00 |
| Lower Austria and Styria | | 26·00 |
| Upper Austria | | 20·00 |
| Dalmatia | | 3·60 |
| Hungary | | 8·00 |
| *Belgium | 1887 | 9·30 |
| Denmark | 1886 | 10·00 |
| *France | 1887 | 8·20 |
| Germany (average) | 1886 | 9·47 |
| Upper Bavaria | | 15·67 |
| Schaumburg-Lippe | | 2·74 |
| Prussia | | 8·24 |
| Alsace-Lorraine | | 8·10 |
| Greece | 1889 | 1·60 |
| *Holland | 1887 | 3·22 |
| Italy | 1887 | 7·45 |
| Portugal (certain provinces only, returns incomplete) | 1885 | 14·00 |
| Roumania | 1887 | 6·00 |
| Russia (average 1867–81) | | 3·00 |
| Spain | 1884 | 5·40 |
| Sweden | 1886 | 14·88 |
| Norway | 1886 | 7·90 |
| Switzerland | 1887 | 4·80 |
| Brazil (estimate) | 1884 | 25·00 |
| †Canada | | |
| Costa Rica | 1886 | 24·00 |
| Guatemala—Whites | 1887 | 50·00 |
| Indians | " | 25·00 |
| ‡United States | | |
| New South Wales | 1886 | 4·65 |
| Victoria | 1887 | 4·78 |
| Queensland | 1886 | 3·97 |
| South Australia, no statistics. | | |
| West Australia | 1888 | 3·95 |
| Tasmania | 1887 | 3·40 |
| New Zealand | 1886 | 3·12 |

In the following table we show the comparative prevalence of illegitimacy in the principal foreign cities :

[illegible]GITIMATE BIRTHS TO EVERY 1000 BORN.

| | | | | | |
|---|---|---|---|---|---|
| [illegible] | 449 | Leipzig | 211 | Ghent | 144 |
| [illegible] | 439 | Dresden | 208 | Hamburg | 138 |
| [illegible] | 430 | Milan | 204 | Frankfort | 132 |
| [illegible] | 396 | Rome | 194 | Turin | 132 |
| [illegible] | [illegible] | Venice | 189 | Antwerp | 120 |
| [illegible] | [illegible] | Breslau | 186 | Cologne | 124 |
| [illegible] | [illegible] | Bucharest | 175 | Palermo | 101 |
| [illegible] | [illegible] | Liege | 174 | The Hague | 99 |
| [illegible] | [illegible] | Christiania | 162 | Naples | 86 |
| [illegible] | [illegible] | Berlin | 154 | Rotterdam | 70 |

[illegible]e figures are presented as abso[illegible]. They can only be approximate [illegible] for in every country there must [illegible] number of bastards who either [illegible] at all, or who are registered as [illegible] as far as they go the figures [illegible]. They do not, however, enable one [illegible]lusion as to the causes of ille[illegible]ect either of religion, of education, [illegible]al occupation, or of distribution of popu[illegible]on. Neither can any theory be well evolved [illegible]n a racial basis when we find Sweden with as [illegible]gh an average as Austria, and both with more [illegible]an twice the average of Italy and Spain. It is a remarkable fact that in the year 1851 more than one-half of the entire births in Vienna were illegitimate, but there is no explanation forthcoming of that fact, nor of the improvement revealed in the above table. In Europe generally, although not universally, there seems a tendency to decrease in the rate of illegitimacy; but how far that appearance may be due to moral causes or merely to more comprehensive statistics it is impossible to say.

In the periodical reports of the respective registrars-general will be found details referring to England, Scotland, and Ireland. The *Victorian Year-book*, by H. H. Hayter, government statistician, may be consulted for the Australasian colonies. The figures for foreign countries have been compiled from official and other sources too numerous to mention. Information about illegitimacy is given in the *Journal de la Société de Statistique de Paris* (24th and 26th years); in *Procedimientos del Departamento Nacional de Estadistica, 1886* (Buenos Ayres, 1887); and in *Popolazione: Movimento dello Stato Civile e Confronti Internazionali per gli anni 1865 83* (Rome, 1884). In the Journal of the Royal Statistical Society (London) for 1859 and 1862 there are interesting papers on the subject in the light of those years. The literature of illegitimacy is, however, as we have said, very meagre.

**Illimani,** one of the principal mountains of the Bolivian Andes, 40 miles SE. of La Paz. Height, 21,150 feet. See ANDES.

**Illinois,** the seventeenth in area of the United States, but the fourth in population, extends from Wisconsin and Lake Michigan on the N. and NE. to the junction of the Ohio and Mississippi rivers at the extreme SW.—a distance of nearly 400 miles. It is bounded on the E. by the state of Indiana, from which it is partly separated by the Wabash River; on the S. it is separated from Kentucky by the Ohio; and on the W. the Mississippi flows between it and the states of Iowa and Missouri. The area is 56,650 sq. m., or nearly that of England and Wales.

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The surface of Illinois is the most level of any state in the Union, except Delaware and Louisiana; and its wide grassy plains, though broken by numerous streams fringed with belts of fine timber, have gained for it the name of the Prairie State. The drainage is towards the south-west, through streams which flow into the Mississippi. The Illinois River, the largest in the state to which it gives name, is formed by the union of two streams in the north-east of the state, about 45 miles south-west of Lake Michigan, and has a south-west course of about 500 miles in all, joining the Mississippi 20 miles above the mouth of the Missouri. The fertile soil—a heavy black loam—with a favourable climate, makes this the richest agricultural state in the Union; and Illinois ranks first for the production of corn, cattle, hogs, and horses.

The following is an exhibit of the chief crops for the year 1889, showing the acreage, product, and value :

| | Acres. | Bushels. | Value. |
|---|---|---|---|
| Wheat | 2,052,388 | 37,201,016 | $20,003,250 |
| Oats | 3,033,936 | 142,150,811 | 28,981,004 |
| Corn | 6,088,267 | 247,980,589 | 58,937,040 |
| Potatoes | 123,758 | 15,855,006 | 4,145,823 |
| Rye | 204,873 | 3,808,410 | 1,400,220 |
| Barley | 40,088 | 1,207,157 | 511,991 |
| Hay | 3,176,281 | (4,010,544 tons) | 26,819,871 |
| Total | 16,210,591 | 448,198,808 | $140,355,280 |

The mineral output of Illinois, especially of bituminous coal, is also large. Nearly a fifth of the entire coalfield of the United States is found in this state, where during the year 1889 there were 49 counties in which coal was mined, and 854 mines in operation. The number of tons of coal mined during the year was 11,597,963, and this industry alone gave direct employment to 30,076 persons, of whom 23,583 were miners. Other minerals are lead, limestone, salt, and fluor-spar, the last found near Roseclare.

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* In the cases marked with an asterisk the percentage is of living births; in the other cases, of total births registered, including still-born.

† No statistics are available for Canada.

‡ In the United States there seems no efficient system of registration of marriages and births—a fact upon which the Commissioner of Labour comments in his recent special report on 'Marriage and Divorce' in the republic. Some of the individual states record the illegitimate births, but the figures are misleading because incomplete. Thus, the state of Indiana returned, in 1886, 38,370 legitimate and 560 illegitimate births—the illegitimate being only about 1·46 of the whole; a result which in the light of the above table we can only regard as due to defective registration.

The position of Illinois presents unusual facilities for commerce. The rivers that cross or touch the state are navigable for over 400 miles, while by way of the great lakes Chicago has also a water-highway to the Atlantic. Moreover, Illinois has more railroads than any other state: in 1889 these presented a total of 10,153 miles. The trade of the state centres in Chicago, and in the article on that city statistics are given, as well as some indication of the leading manufactures. Of these last the principal are connected with agriculture.

The state is divided into 102 counties. The governor and most of the other state officers are elected for four years, the judges of the supreme court for nine. The legislature meets biennially; and to the lower house each district returns three members, cumulative voting being permitted in order to provide for the representation of minorities. Twenty representatives are sent to the Federal congress. The provisions for education are liberal. The state maintains two normal schools, an agricultural college, and an industrial university; and besides these there are many other colleges and universities. A compulsory educational law is in force, which requires children between the ages of seven and fourteen to attend for at least sixteen weeks in the year some public day school, or some private school teaching the branches commonly taught in the public schools. In the year 1889 there were 763,411 pupils and 23,089 teachers in the common schools: and $11,730,895 was expended in the support of these schools. The state charitable institutions include four hospitals for the insane, at Elgin, Kankakee, Jacksonville, and Anna; an institution for the deaf and dumb, and another for the blind at Jacksonville; an asylum for the feeble-minded at Lincoln; a home for the orphans of soldiers at Normal; and eye and ear infirmary at Chicago; a reform school for boys at Pontiac; and a soldiers' and sailors' home at Quincy. The average number of inmates for the year ending July 1, 1889, was 6024, and the ordinary expense of maintenance, including salaries, was $1,005,617.

Formerly a part of the North-west Territory, Illinois was organised as a territory in 1809, and admitted as a state on 3d December 1818. While the Federal law at that date made a population of 40,000 a condition of admission, it is well established that the actual population of Illinois was then but 34,620. In 1830 the population numbered 157,445; in 1850, 851,470; in 1870, 2,539,891; in 1880, 3,077,871, showing a remarkable increase. Chicago is by far the largest city of Illinois; its limits embrace nearly a fourth of the entire population of the state. Peoria, Quincy, Springfield (the capital), and Bloomington rank next in population. Important events in the history of Illinois have been the Indian wars of the territorial period, the Black Hawk war of 1832, and the Mormon (q.v.) troubles in 1840–44. The state raised six regiments for the Mexican war, and during the civil war contributed 259,092 men to the Union armies, of whom over 29,000 were killed in action or died of wounds or disease. At Springfield Abraham Lincoln lived before he was elected president, and there he is buried. See S. Breese, *Early History of Illinois* (Chicago, 1884); J. Moses, *Illinois, Historical and Statistical* (Chicago, 1889).

**Illiterates,** a term used to designate those persons who are unable to read or write, or both. The percentage of illiterates in a country furnishes one of the few means of estimating quantitatively the average level of intelligence, or at least of education, possessed by the people of that country. Unfortunately a strict comparison cannot be made, because the statistics of illiteracy in different countries are not based upon one uniformly recognised method of obtaining them. (1) A few countries—e.g. the United States, Hungary, Italy, and Portugal, and the Australian colonies of Victoria and Tasmania—have endeavoured to take an exact census of illiterates; in their enumerations all children below six years of age were excluded, except in the United States, which excluded all children below ten years of age.

| | | | |
|---|---|---|---|
| United States (1880) | 22·15 p.c. | Hungary (1880) | 57·14 p.c. |
| Italy (1881) | 54·30 " | Portugal (1878) | 79·07 " |

The high percentage of the United States is due to the low educational status of the Negro population. In 1881 there were in the colony of Victoria 23·80 per cent. of illiterates, and in Tasmania 43·78 per cent. Of the other methods that are employed to ascertain the number of illiterates (2) the most complete results are afforded by the enumeration of the men and women who, on the occasion of their marriage, are unable to sign their names in the registers. On this basis we have the following results for comparison in the year 1886:

| Country. | Men. | Women. | Mean. |
|---|---|---|---|
| England and Wales | 9·60 | 11·50 | 10·55 |
| Scotland | 4 05 | 8·28 | 6·46 |
| Ireland | 23·40 | 25 30 | 24·35 |
| Victoria | 2 00 | 1·98 | 1·09 |
| New South Wales | 3·76 | 4·20 | 3·98 |
| Queensland | 4·52 | 6·71 | 5·02 |
| South Australia | 3·04 | 3·49 | 3·26 |
| New Zealand | 1·92 | 2·89 | 2·40 |
| Prussia (1884) | 3·31 | 5·11 | 4·21 |
| France (1882) | 14·39 | 22·62 | 18·50 |
| Italy (1887) | 42·36 | 62·80 | 52·58 |

In 1887, 9·10 per cent. men and 10·60 per cent. women in England and Wales, 22·20 per cent. men and 24·80 per cent. women in Ireland, and 4·49 p cent. men and 8·20 per cent. women in Scot signed the marriage registers with their instead of their name. In Queensland the were 3·53 per cent. men and 5·39 per cer in 1887. (3) The next best method i the illiterate recruits who join tl those countries in which universal in force. The subjoined table give recruits who were unable to read a respective countries named:

| | | |
|---|---|---|
| Baden (1884) | 0·02 | Holla |
| Würtemberg (1884) | 0·02 | Franc |
| Bavaria (1884) | 0·08 | Belgiu |
| Saxony (1884) | 0·15 | Austri |
| Sweden (1883) | 0·27 | Hung |
| Denmark (1881) | 0·36 | Italy ( |
| Germany (1884) | 1·27 | Russi |
| Switzerland (1888) | 1·3 | Servia |
| Prussia (1884) | 1·97 | |

(4) At the last general electio and Ireland there voted in En 38,587 illiterate persons, in Scotl land 36,722, giving a percentage o total of 2,969,381 voters who went to Out of a total of 34,473 persons of all ages in the colony of Victoria, in the year 1887, 26 could only read or write imperfectly, and 3333 totally unable to read, a percentage of 86 illiterates apprehended. Illiteracy among voters, both white and black, increased enormously in the south of the United States between 1870 and 1880. In Texas in 1870 there were 17,500 illiterate voters; in 1880 there were 33,085. People who are unable to sign their name usually attest a legal document by making a simple cross, the making of which must be duly certified by a witness who can write.

**Illuminati** (Lat., 'the enlightened'), a name which has been assumed by or conferred upon various bodies of mystics, because they professed to have special knowledge of God and things divine. The sects which may be included under the title are the *Alombrados*, who originated in Spain about 1520, and were finally crushed by the Inquisition; the *Guérinets* in France, who flourished from 1623 to 1635; another sect which arose in the south of France about 1722, and perished in the storms of the Revolution; an association of mystics in Belgium, in the later half of the 18th century. But the name is more particularly given to the Order of the Illuminati, founded at Ingolstadt on May 1, 1776, which soon spread over almost all the Catholic parts of Germany. Its founder, Adam Weishaupt (1748-1830), professor of Canon Law at Ingolstadt, at first called it the Order of the Perfectibilists. Filled with detestation of Jesuitism, and impatient of the restraints which were at that time imposed on the freedom of human thought in Catholic Germany, especially in Bavaria, Weishaupt set himself to combat ignorance, superstition, and tyranny, by founding an association which should be a luminous centre for the promotion of rational and religious enlightenment. Religious dogmas and forms of worship were rejected; his religious system was a form of deism. But the society prosecuted political aims as well, in that the members of the highest of the orders into which it was divided were pledged to the furtherance of Republican opinions. Implicit obedience to the chiefs of the association was one of the first laws of its constitution. The accession of Baron von Knigge to the new order, and the support which it received from the Freemasons, led to its rapid extension; about 1780 it counted more than 2000 adherents, mostly men of rank and influence. It was regarded with favour by Goethe, Herder, Nicolai, Ernest II. of Gotha, and Karl August of Weimar. Weishaupt and Knigge quarrelled in 1784. The order began to be openly denounced [illegible] dangerous, in 1784 and 1785 edicts were issued [illegible] Elector of Bavaria for its suppression, and [illegible]aupt was degraded and banished. See his [illegible]*te der Verfolgung der Illuminaten* (1787) [illegible] *Rechtfertigung meiner Absichten* (1787). [illegible] the system of the French illu[illegible] [illegible]times used as a synonym for Free[illegible] [illegible] unbelief, from a Catholic point of [illegible]

**[illegible] of Manuscripts,** the art of [illegible]ipts with miniatures and orna[illegible] [illegible] the most remote antiquity. The [illegible] containing portions of the Ritual [illegible]he Dead' are ornamented with [illegible]gs and coloured pictures. Except [illegible] other manuscripts of antiquity [illegible] w[illegible]aking, illuminated; such Greek [illegible]scripts of the 1st century as have [illegible]ent day being written only. Pliny, [illegible] from Varro that authors had their [illegible] painted on their works, and refers to a [illegible]graphical work, with numerous portraits introduced, but all such have disappeared in the wreck [illegible] ages; the oldest illuminated MSS. which have survived being the *Dioscorides* of Vienna and the *Virgil* of the Vatican, both of the 4th century, and ornamented with vignettes or pictures in the Byzantine style of art. St Jerome, indeed, in the same century, complains of the abuse of the practice, as shown by filling up books with capital letters of preposterous size. The Byzantine style strongly influenced every other early style throughout the West, and its influence can be traced as late as the 11th century.

The art of illuminating manuscripts with gold and silver letters is supposed to have been derived from Egypt, but it is remarkable that no papyrus has any gold or silver introduced into it. The artists who painted in gold, called *Chrysographi*, are mentioned as early as the 2d century. One of the oldest manuscripts of this style is the *Codex Argenteus* of Ulfilas (360 A.D.); and the charter of foundation of Newminster at Winchester by King Edgar (966 A.D.), six centuries later, shows the use of these letters. Gold letters seem to have been used in the East during the 12th and 13th centuries. At an early period the use of illuminated or decorated initial letters commenced—to be distinguished from the illuminated or painted pages placed at the head of Byzantine manuscripts. Originally they were not larger than the text, or more coloured; but the Syriac manuscripts of the 7th century have them with a pattern or border; and they go on increasing in size and splendour from the 8th to the 11th century, when large initial letters, sometimes decorated with little pictures or miniatures, came into fashion in the Greek and Latin manuscripts. The subjects of the figures mixed up with the arabesque ornaments often referred to the texts; warriors and warlike groups of figures being introduced when the text referred to war, symbolical representations of hell where the chapters following treated on that region. These initial letters soon increased to a great size, being from 2 to 24 inches long; they were most used in the 8th and 9th centuries, but continued till the 12th century, and degenerated in the 16th to the last decadence of art—the grotesque. In the 13th century burnished gold was used as a background for letters and miniatures, and so finely were these backgrounds executed that they appear like plates of solid gold. The art which flourished in the eastern and western empires passed over to Ireland, and there gave rise to a separate school or kind of illumination. This style, which consists in a regular series of interlaced ribbon ornaments, often terminating in the heads of gryphons and other animals, seems to have been derived from the later patterns of Byzantine art, seen on mosaics, mural paintings, and other objects. This Celtic style is finely exhibited in the remarkable MS. at Trinity College, Dublin, known as the 'Book of Kells,' which is believed to be of the 9th century. The minute size and number of the interlacements is quite wonderful.

The Hiberno-Saxon style is seen in the so-called Durham Book in the British Museum (Cott. MS. Nero D. IV.), which is only second to the Book of Kells in beauty. It was written by Eadfrith, Bishop of Lindisfarne (died 721), in honour of St Cuthbert. The various schools of art in the middle ages found their homes in the different monasteries, and the so-called *Opus Anglicum* is exhibited in the Benedictional now in the possession of the Duke of Devonshire at Chatsworth. This was produced at the Old Minster at Winchester, and was executed by Godemann (afterwards abbot of Thorney) for Ethelwold, Bishop of Winchester (963-984).

In the 12th century a new style arose which was distinguished by the profusion of its ornamentation, intricate modes of illumination, and abundant use of gold and silver. In the 13th century the art still more deteriorated in western Europe, but the manuscripts of the 14th century show a great advance in painting over the works of previous centuries. Dante's *Divina Commedia* in the British Museum (Egerton MS. 943) is a fine specimen of the work of Italian artists in this century. The Arundel Psalter, also in the British Museum (Arundel MS. 83), is a noble work of English artists. It was given by Robert de Lyle to his daughter Audry in 1339.

In the 15th century the art of miniature began to decline in England, and the finest works were produced by foreign painters. This is the case with the famous Bedford Missal in the British Museum. It was prepared for John, Duke of Bedford, son of Henry IV. and Regent of France, on his marriage in 1423 with the daughter of John, Duke of Burgundy. The duchess presented the MS. (with her husband's consent) to Henry VI. on Christmas Eve, 1430. In this same century were produced the celebrated choir books in the cathedral of Siena, by Girolamo da Cremona and Liberale da Verona, who were paid for their work in 1468 and 1472–73. One of the most beautiful specimens of the work of the next century is the Book of Hours of Anne of Brittany, wife of Louis XII., which has borders of natural plants on a gold ground. The artist to whom we are indebted for this priceless monument of French art at the period of the Renaissance was Jean Bourdichon (1457–1521).

The usual mode of production adopted in the Scriptorium was for the scribe to rule a space for his text in accordance with the general design, and to write within these limits. He was followed by the illuminator of initials, borders, and ornamental accessories. Then came the miniaturist. St David, the patron saint of Wales, is said to have been an assiduous illuminator, and among the most celebrated miniaturists may be mentioned Giotto (1276-1337), Fra Angelico (1389-1455), Attavante (1455-1520), Julio Clovio (1498-1578), Vincenzo Raimondo (died 1557), and Boccardino (16th century). Raphael and Jan van Eyck might be added to the list. That splendid example of Flemish illumination, the Franciscan Breviary of Cardinal Domenico Grimani (1461-1523), has been attributed to Memling, but later inquiries have proved that he had nothing to do with it.

In the reign of Louis XIV. the art became extinct, ending with a style of painting called *camaieu gris*, a kind of monochrome, in which the lights are white or gold, and shaded so as to emulate bas-reliefs. Among oriental nations the Persians, Hindus, and Chinese have illuminated manuscripts of great beauty, none of which, however, can compete with those of the western nations in antiquity. For beauty of design some of the Arab manuscripts are charming, but their antiquity does not reach beyond the 13th century. The Chinese Buddhists have also illuminated classics, or religious books of their sect, one of which, the *Diamond Book*, as it is called, in the British Museum, has a text splendidly printed in silver and gold letters on a blue ground, and the vignettes charmingly painted in tempera, on macerated leaves of the *Ficus Indica*.

See J. W. Bradley, *Manual of Illumination* (1861); *Dictionary of Miniaturists* (3 vols. 1887-89); H. Shaw, *Handbook of the Art of Illumination as practised during the Middle Ages* (1866); W. & G. Audsley, *Guide to Illuminating and Missal Painting* (1861); W. De Gray Birch & H. Jenner, *Early Drawings and Illuminations* (1879).

**Illuminations.** See PYROTECHNY.

**Illusions** are usually distinguished, as having some basis in outward physical facts, from *delusions*, which are purely subjective hallucinations, with no foundation save perverted imagination, or otherwise disordered faculties. Optical illusions are exemplified by the appearances connected with mirage. See OPTICAL ILLUSIONS, APPARITIONS, DREAMS, HALLUCINATIONS, INSANITY; and Sully's *Illusions* (Inter. Sc. Series, 1881).

**Illustration of Books.** Since man first discovered how to convey his thoughts to others by means of writing, he seems to have felt the want of some method of illustration or embellishment. From the Egyptian papyrus down to the invention of printing this was supplied by pictures, coloured or uncoloured, engravings, carvings, &c., executed by hand, and so far as these have any connection with books or writings their history will be found in the article ILLUMINATION OF MANUSCRIPTS. The first printed books were entirely illustrations, both pictures and text being printed from blocks engraved on wood in relief, such as the Biblia Pauperum (q.v.), and many others. The *Ars Memorandi* (end of 15th century) comprised fifteen New Testament pictures, faced by the same number of text pages, all engraved on wood. The Mazarin Bible (1455), the first book completely printed from movable types, many of the copies of which were beautifully embellished by hand, was sold as a manuscript, till the number of copies aroused suspicion. Many other spurious MSS. were produced in the same way, the larger price obtained for them forming a temptation to those having the secret of printing.

The first edition of the *Speculum Humanæ Salvationis*, said to have been printed by Coster about 1440, is supposed to be the first book in which two different coloured inks were used on the same page; and the ornamental capitals in the Psalter of Fust and Schöffer in 1457 are beautiful specimens of printing in two colours. Probably the first printed book with wood-engraved illustrations used throughout the text was the Fables of Ulrich Bohner, issued by Albert Pfister, printer of Bamberg, in 1461, which had 101 engravings on wood. In Italy the first known example is the *Meditationes*, published by Ulrich Hahn, a German, in Rome, 1467, of which three copies are still known to exist. The most artistic book of this period was certainly a volume on military art by Valturius, illustrated by eighty-two designs by Matteo Pasti, at Verona, in 1472. The designs are in outline and very cleverly drawn, though poorly engraved.

The invention of the method of printing fro[illegible] engraved (intaglio) plates introduced a new f[illegible] into book illustration. *Il Monte Santo di* [illegible] (Florence, 1477) was the first book issued [illegible] illustrations engraved on metal.

In the beginning of the 16th century m[illegible] were beautifully illustrated by pictu[illegible] oscuro, produced by three or four blo[illegible] on wood, printing different shade[illegible] colour, generally ochre, brown, gra[illegible] of the original drawings being by [illegible] Parmigiano, and other masters. A[illegible] of the 16th century engraved pla[illegible] used in conjunction with wood-eng[illegible] same books; and from this period [illegible] supremacy began between the t[illegible] finally resulted in favour of meta[illegible] the century. Wood-engraving [illegible] vived by Bewick, and metal-engra[illegible] ing had the field to themselves. Du[illegible] century many books were beautifully [illegible] by engraved and etched title-pages, vignettes, [illegible] tailpieces, the most celebrated artists making designs for the purpose; the type was first printed, leaving spaces on which the plates were afterwards printed. The lead taken by France in the 18th century was closely followed by Germany and England. Coloured illustrations, when not coloured by hand, as they generally were, were printed by means of numerous carefully prepared wood blocks, each printing a different colour. An elaborate account of the method will be found in Savage's work. In short, the history of book illustration reflects more or less faithfully the state of art of the period, and it may be traced in the articles Book, Engraving, Wood-engraving, Bartolozzi, Bewick, Caxton, Dürer, Hogarth, Turner, &c.

The invention of lithography in 1796 introduced a third element, which was immediately taken advantage of. Being much cheaper than steel-engraving, it gradually tended to supersede that process for book purposes, its special adaptability for coloured work giving it great advantages over its rival. In England book illustration may be said to have reached its culminating point as regards engraved and etched plates in the first half of the 19th century, in the series of annuals, keep-sakes, and the higher-class books illustrated by such masters as Stothard, Turner, &c. The revival of wood-engraving by Bewick and his pupils gradually led to the restoration of that art as an illustrating medium. In this it was greatly aided by the facility with which wood engravings can be printed along with the text, together with the advance made in typographic printing. The series of Christmas books illustrated by John (afterwards Sir John) Gilbert and Birket Foster had no small share in that advancement. Among the artists who have helped to raise the art to its present high position may be mentioned Cruikshank, H. K. Browne (Phiz), Doyle, Leech, Tenniel, Millais, F. Walker, W. J. Linton, Herkomer, &c. The development of what has been called the American school of wood-engraving has still further increased the influence of that branch of art for illustrative purposes.

*Relief-block Processes for Book Illustration.*—While Photogravure (*q.v.*) threatens the final extinction of steel-engraving, very many processes have been invented to produce relief blocks with a view to supersede wood-engraving in book illustration. The object aimed at is to reproduce drawings in line or wash, in fac-simile, on a relief block capable of being printed from the surface at the type press. That is, the lines or parts which impress the paper are to be left in relief, while the white parts are cut out so as to leave the paper unprinted.

What are called 'process' relief blocks may be
ed into two kinds—those reproduced from
and-white, or line drawings by pen and ink,
se from half-tone photographs or wash
The former, as being the simpler, we
e first.

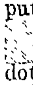
st form of it is when a drawing is
r ink on lithographic transfer paper
HY), or when a proof of a line
e or line engraving can be got in
his transfer drawing or proof is
e polished surface of a zinc plate
lithographic manner. Zinc is
ecause it is cheap, and is readily
ng acid; but copper is sometimes
ine work. After the transfer the
and the lines are inked repeatedly
ting of ink covers the lines of
Powdered asphalt, or other similar
then dusted over the plate, which
heated till the asphalt is incorpor-
the ink. The back of the plate and
er parts not requiring to be etched are
red by varnish, and the plate is put into
ath of acid for the uncovered parts to be
hed away, leaving the lines in relief. As the etching, if carried on continuously, would undermine the lines and finally eat them off altogether, the plate is removed from the bath after a very slight etching. It is then washed and gently heated, which causes the asphalt and ink to run down the side of the lines already in relief, and protect them from further etching. This is a very delicate part of the process, and great skill is required to let the protecting compound run down enough and no more. The plate is returned to the bath and etched a little more. The washing and heating is repeated, and so the etching and heating goes on gradually till a sufficient depth is obtained for the fine parts. During the etching a rocking motion is given to the bath to make the acid act more equally and allow the bubbles of gas to escape. The larger white parts are generally cut deeper afterwards with machine drills.

When other than transfers are to be reproduced, such as pen-and-ink drawings, engravings, or any other drawing in line, the subject is photographed to the required size. Here this process has a decided advantage over that just described, inasmuch as the drawing to be copied may be made of any convenient size, while a drawing on transfer paper must be of the exact size required. The photograph being obtained, it is treated as for a photo-lithograph (see LITHOGRAPHY), transferred to stone, and a re-transfer taken to put on the zinc, which is then treated as already described. By this process a little of the sharpness of the drawing is lost by the repeated transfers, every one tending to thicken and blur the lines a little; a more direct method of putting the drawing on the zinc is as follows. The plate is thinly and evenly coated with bitumen, bichromatised albumen, or other substance sensitive to the action of light. A very strong photographic negative, taken in reverse from the drawing, in which the lines are clear glass and the lights as dense as possible, is put on the plate and exposed to the light. The light acting through the lines on the negative render the corresponding parts of the coating on the zinc, to a sufficient extent, insoluble, while the light parts, being protected by the negative, can be dissolved out by a suitable solvent in the case of bitumen, or washed off if the albumen method is used. The drawing is thus left on the zinc in bitumen, and, as that substance is a good protective against acid, the plate is etched as already described.

There are also several gelatine processes, one or two of which may be shortly described. In the *swelled gelatine* process a plate of glass, coated with a film of bichromatised gelatine, is exposed under a negative, from a line drawing, and afterwards soaked in cold water, when the parts not acted upon by the light will swell up sufficiently to allow of a cast being taken which will give the lines in relief, or, if the plate be put in *hot* water, will be removed altogether, *leaving* the lines in relief. Or, if a photo-*positive* be put on the film, the lines will be left soluble and may be dissolved out by hot, or swelled up by cold water. In these gelatine processes, however, the relief is very low, and the white parts have to be made up with heated wax by hand, which is a very delicate process, or cut away in a subsequent stereotype. In some methods a solid slab of prepared gelatine is used, when the etching or dissolving out may be made as deep as required.

There are an infinity of other slightly differing processes for producing the same result, but as they are all more or less founded on the same principle, they do not call for separate description.

The production of relief blocks from ordinary photographs or drawings made by washes of black and white is a much more delicate matter. Intaglio plates have indeed been in successful use for many years (see PHOTOGRAVURE), but relief blocks until the invention of Meisenbach's process baffled all efforts. As in relief block every part which touches the paper prints *black*, and every part which does not touch the paper leaves it *white*, it is obvious that until some method was devised of turning the smoothly graded tones of a photograph into something which could be represented in pure black and white, success was impossible.

The method sought after was to break up the photo-tones into some sort of grain, stipple or line, which should be closest in the darkest parts, and become more open as the lights were approached. It would be unadvisable, even if it were possible, to enumerate all the devices which have been invented and patented for this purpose. That patented by Meisenbach of Munich in 1882, however, as the one on which nearly all the most successful subsequent processes are based, may be briefly explained. A glass plate is prepared with fine parallel lines, thus . This is exposed between the lens and the sensitive plate in the camera, at a very short distance from the plate, and when the exposure is half completed the cap is put on the lens, the lined plate is taken out and put in with the lines in the reverse direction, thus , and the exposure is completed. The resultant negative is thus broken into minute regular dots.

In another process invented by Mr Ives, of Philadelphia, and finally patented in 1884, which has had considerable success in America, a swelled gelatine relief is taken of the subject, and on a plaster cast of this a stipple is impressed by means of an elastic stamp, which gives the operator great control over the effect. He is then able to ink the plaster cast and transfer an impression of it to a sheet of india-rubber, and from that to a plate of zinc.

A *grained* photograph being finally obtained by means of any of the thousand-and-one processes, it is transferred to zinc and etched as described for the line process.

In addition to these photo-chemical processes, there are several mechanical methods of producing relief blocks, of which Messrs Dawson's Typo-etching process, an improvement upon Palmer's Glyphographic process (patented in 1848), is very extensively used for the production of maps, plans, diagrams, &c. A polished brass plate is covered with a film of prepared wax, on which the lines are drawn with special etching needles which clear away the wax down to the metal. Letters and words are stamped through the wax with types of varying sizes as may be required. The wax, which is of course very thin, is added to by melting other wax over the surface with a heated pointed metal tool. This stream of melted wax is skilfully prevented from running into the lines or letters, and when thick enough to give sufficient depth to the finished block, an electrotype is taken from the plate, in which the cleared surface of the brass forms the raised lines, and the built-up wax the sunk or white parts. This electrotype is the printing block. This process is carried to great perfection in the United States, where most beautiful maps are produced by it.

Many other mechanical methods are used in engraving and etching, but generally they are too technical to be detailed here, and we have described nearly all which are of any public consequence.

It is obvious that these various processes, though simple enough in theory, give great scope for skill in manipulation, and much of their success depends on the ability of the operator. As a means of illustrating books they are making rapid strides towards complete success within the bounds, not by any means unlimited, of their capabilities. The rapidity with which they can be produced has rendered the daily illustrated paper a possible and accomplished fact. As to cost, blocks can be produced for from 4d. to 1s. 6d. per square inch of surface, according to the nature of the drawings—the stipple process being the more expensive.

The first and most important requisite is to obtain drawings suitable for the purpose, and these should be made by artists who have studied the capabilities and requirements of the various methods. For the line processes the drawings, when not executed on transfer paper, should be made on bristol board or smooth-surfaced white paper, with some dense black pigment, as much of the success depends on the sharpness and blackness of even the faintest lines. Stephen's ebony stain, Winsor & Newton's liquid lampblack, and other pigments have been used for the purpose. The drawings should be larger than the required reproduction, as the reduction tends to refine the block, and care should be taken to see that every detail is exactly as wanted, for the process reproduces the defects as strongly as the beauties of a drawing. Given proper drawings and subjects suitable for the purpose, this process undoubtedly is capable of producing first-class work.

The stipple or Meisenbach process is a much more delicate affair, and from the care with which its blocks require to be printed, on account of the necessarily shallow nature of the etching, its application is much more limited. If nature photographs are reproduced on too small a scale, the stipple, if coarse, obliterates much of the detail, and, if too fine, is apt to blur in printing. But when drawings are specially made for it by artists who understand its requirements, it is capable of very fine results, and the drawing is reproduced with a fidelity seldom seen in an engraving. The drawings may be executed in lampblack and Chinese white, or any pure monochrome.

In France, Germany, and the United States the processes have been much more employed as a means of book illustration than in Britain, though even there every year shows a rapid advance in their use.

*As to the comparative merits of wood-engraving* and the processes, opinions, of course, differ greatly. Generally, it may be said that the processes are more suited for subjects on a large than on a small scale, unless they are very slight, in which ca[illegible] they can never pretend to be more than ske[illegible] The great advantage is that of price, and [illegible] course tells more in large than small subjec[illegible] the present work, for instance, it is found t[illegible] engraving is much more suitable than [illegible] and all the illustrations, except maps[illegible] in that manner. This holds good [illegible] good photographs from nature ca[illegible] production, such as architecture[illegible] reproduced by the stipple proc[illegible] scale, much of the detail would [illegible] have special drawings prepared w[illegible] to as much as wood-engraving, an[illegible] of the accuracy of the photograp[illegible] In wood-engraving the photogra[illegible] ferred direct on to the wood and [illegible] further expense for drawing, an[illegible] artistically and from a printing [illegible] much more satisfactory. The te[illegible] present work, after the second volume, [illegible] by the typo-etching process, which answers [illegible] ably. Although, as we have stated, within [illegible] limits the process makes good work, and the fu[illegible] is before it, still the fact remains that as yet, [illegible] finished picture work, good wood-engraving has not been superseded. For purely photographic methods of book illustration, see PHOTOGRAPHY.

See W. Savage, *Practical Hints on Decorative Printing* (Lond. 1822); Paper on Illustrated Books in *Q*
*Magazine*, vol. lxxiv. (June 1844); H. T
*Printed Book: its History, Illustrations*
by E. C. Bigmore, Lond. 1887; new ed.
*Recent Improvements in Photo-mech*
*Methods* (1884); J. S. Hodson, *Guide to*
(1884); Josef Böck, *Zincography* (trans.
1886); *Modern Methods of Illustrating*
1887); Joseph Pennell, *Pen Drawing and*
*men* (London and New York, 1889).

**Illyria** (Lat. *Illyricum*), in ancient times the country that stretched along the eastern side of the Adriatic Sea, from Epirus northwards. It was not a homogeneous territory, but varied in extent at different periods of its history. The region was inhabited by numerous tribes, who seem seldom to have been held together by any sort of political cohesion. From some cause or other—probably the mountainous character of the region they inhabited was the principal cause—they were the last of the peoples of the Balkan peninsula to be brought within the fold of civilisation. The single Greek colony of Dyrrhachium or Epidamnus, in the south, was the only point whence the rays of Greek enlightenment could penetrate the darkness of Illyrian barbarism. The Illyrians are described as resembling the savage Thracians in their manners, as tattooing their bodies, as offering human sacrifices to their deities, but as honouring women, who even held chieftainships amongst them. For many years they seem to have kept up a series of incessant attacks upon the early kings of Macedonia; they levied tribute from Amyntas II., and slew Perdiccas (359 B.C.). But they were subdued by Philip II. and Alexander, who annexed their country to Macedonia. In the 3d century, after the breaking up of the Macedonian monarchy, they caused much annoyance to Greece and Italy by their piratical excursions. At length the patience of Rome was exhausted, and in two short wars (229 and 219 B.C.) she succeeded in subjugating the refractory Illyrians. Fifty years later they provoked a third war with Rome, which resulted in their defeat and the incorporation of their territories in the all-victorious republic. Nevertheless, the Illyrians only consented to be civilised at the sword's point, they frequently rose in revolt against their conquerors; but in 35 B.C. Illyria was made a Roman province. During the empire they served faithfully in the [illegible]n armies, and even gave half-a-dozen [illegible]rs to the state, as Claudius II., Aurelian, [illegible]ian, Probus, and some others. Under the [illegible]he emperors the political importance of [illegible] Illyricum, as the Romans called it, [illegible]creased. In the 2d century Illyria [illegible] north as the Danube, and even [illegible]d included Noricum, Pannonia, [illegible] and Dacia. Constantine still [illegible]ts boundaries, and made it one [illegible] divisions of his empire. But [illegible] was divided between East and [illegible]s also divided. Noricum, Pannonia, [illegible]&c. were designated as Illyris [illegible]rporated with the empire of the [illegible]ræca, embracing Greece, Macedonia, [illegible], was attached to the eastern [illegible] period of the final dissolution of [illegible] and [illegible]pire Illyria was successively over-[illegible]oths, the Huns, and several Slavic [illegible] and nearly all traces of civilisation dis[illegible]ared. The Illyrians themselves partly amal[illegible]ated with the Huns and their Slavic con[illegible]rors, and partly were driven southwards, where [illegible]e of their tribes, the Albani, survive, at all events in name, in the modern Albanians. As the several Slavic states became consolidated and rose to power, the political importance of Illyria, and even its name, gradually died away. The name was revived in quite modern times, when Napoleon, in 1809, formed the territories he had wrested from Austria into the Illyrian provinces. In 1816, when they were restored to Austria, this power constituted out of them and the provinces of Carinthia, Carniola, Görz, Gradisca, and Istria the kingdom of Illyria. But the designation was dropped in 1849, and the territories included in it were reorganised as provinces.

The geographical features of Illyria are described under BOSNIA, DALMATIA, MONTENEGRO, &c., the modern states or provinces with which it most nearly coincided.

The name Illyrian is also used in three other significations. In the 17th and 18th centuries it was used to indicate those Slavs who were members of the non-united Greek Church—i.e. principally the Servians or Razans. In the 19th century the terms Illyrian and Illyrian peoples were used in connection with the idea of the union of the Southern Slavs—the Servians, Croatians, and Slovenians—into a revived Illyrian kingdom, an idea which seems to have been first made current by Gaj about 1835. Illyrian literature is sometimes used when Servian literature is meant; and Servian literature in this sense includes Dalmatian or Ragusan literature. See SERVIA, and RAGUSA. The scene of Shakespeare's *Twelfth Night* is laid in Illyria.

**Ilmen** (formerly *Moysk*), a lake in the Russian government of Novgorod, with an area of 354 sq. m., and a depth varying from 7 to 30 feet. The rivers Shelon, Lovat, Msta, and several others flow into the lake, which discharges its waters through the river Volkhof into Lake Ladoga. The lake abounds in fish.

**Ilminster,** an ancient market-town of Somersetshire, is situated on the Isle, 11 miles SE. of Taunton by rail. The church is a noble example of Perpendicular architecture. Some manufactures of ropes, bricks, and tiles are carried on. Pop. of parish (1831) 2957; (1881) 3281.

**Il Obeid.** See OBEID.

**Ilori,** or ILORIN, capital of the Yoruba state of the same name in western Africa, and one of the chief commercial centres of the Guinea region, stands, at an elevation of 1300 feet, about 160 miles NNE. from Lagos (on the coast). The people, 150,000 in number, consist of Yorubas, Haussa, Fulah, and others, and make cloth, arms, and leather. They are excellent horsemen and good warriors. Their ruler pays tribute to the sultan of Gando. The religion is Mohammedanism, corrupted by strong traces of heathenism.

**Ilsley,** EAST, or MARKET ILSLEY, a market-town of Berkshire, situated amid bleak and dreary downs, 9 miles N. of Newbury and 6½ S. of Didcot. Its sheep-markets count among the most important in the kingdom. Pop. 577. Archbishop de Dominis was rector of West Ilsley, 2 miles north-west. Pop. 377.

**Image.** See LENSES, MIRROR.

**Image-worship** (Gr. *eikonolatreia*), the use in public or private worship of graven or painted representations of sacred persons or things, and especially the exhibition of honour, reverence, or worship to or towards such representations. Neither in the New Testament nor in any genuine writings of the first age of Christianity can any trace be discovered of the use of statues or pictures in the worship of Christians, whether public or private. The earliest allusion to such representations is found in Tertullian, who appeals to the image of the Good Shepherd as engraved upon the chalices. A very curious pagan caricature of Christianity of the same age, lately discovered scratched upon the wall of a room in the palace of the Cæsars (see GRAFFITI), which rudely represents a man standing in the attitude of prayer, with outstretched hand, before a grotesque caricature of the crucifixion, and which bears the title 'Alexamenus worships God,' has been recently alleged by Catholics as an additional indication of at least a certain use of images among the Christians of the 2d century. The tombs of the Christians in the

Roman catacombs, many of which are of a date anterior to Constantine, frequently have graven upon them representations of the Dove, of the Cross, of the symbolical Fish, of the Ship, of Adam and Eve, of Moses striking the rock, of Jonah, of Daniel in the lions' den, of the apostles Peter and Paul, and above all, of the Good Shepherd; and those compartments of the catacombs which were used as chapels are often profusely decorated with sacred representations, the age of which, however, it is not easy to determine with accuracy. It is admitted by Catholics, however, that, from the fear of perpetuating idolatrous notions, for the first three centuries the use of images was rare and exceptional; nor was it until after the establishment of Christianity under Constantine, and particularly after the condemnation of the Nestorian heresy in 430, that statues and pictures of our Lord, of the Virgin Mary, and the Saints, were commonly introduced in churches, especially in the East and in Italy. And yet even in the 5th century the practice had already reached a great height, as we learn from the church historian, Theodoret, for the East, and from Paulinus of Nola, for Italy; and in the 6th and 7th centuries many popular practices prevailed which called forth the condemnation of learned and pious bishops both in the East and in the West. It was usual not only to keep lights and burn incense before the images, to kiss them reverently, and to kneel down and pray before them, but some went so far as to make the images serve as godfathers and godmothers in baptism, and even to mingle the dust or the colouring matter scraped from the images with the eucharistic elements in the Holy Communion! This use of images by Christians was alleged as an obstacle to the conversion of the Jews, and as one of the causes of the progress of Mohammedanism in the East; and the excesses described above provoked the reaction of Iconoclasm (q.v.). In the second Council of Nice (787) the doctrine as to the worship of images was carefully laid down. A distinction was drawn between the supreme worship of adoration, which is called *latreia*, and the inferior worship of honour or reverence, called *douleia*. The second Council of Nice declared that the worship to be paid to images is not the supreme worship of *latreia*, but only the inferior worship of *douleia*; and also that it is not *absolute*, and is not rendered to the images themselves, but *relative*—i.e. only addressed through them, or by occasion of them, to the original which they represent. A strange error in the translation of the Greek acts of the Council of Nice, by which it appeared that the same adoration was decreed by that council to images 'which is rendered to the Holy Trinity itself,' led to a vehement agitation in France and Germany under Charlemagne, and to a condemnation by a synod at Frankfort of the doctrines of the Council of Nice. But an explanation of this error, and of the false translation on which it was based, was immediately afterwards given by the pope; and eventually the Nicene exposition of the doctrine was universally accepted in the Western as well as in the Eastern Church.

At the Reformation the reforming party generally rejected the use of images as an unscriptural novelty, and stigmatised the Catholic practice as superstitious and even idolatrous. The Zwinglian, and subsequently the Calvinistic churches entirely repudiated all use of images for the purposes of worship. Luther, on the contrary, while he condemned the Roman worship of images, regarded the simple use of them even in the church for the purpose of instruction and as incentives to faith and to devotion as one of those *adiaphora*, or *indifferent* things, which may be permitted, although not of necessary institution; hence, in the Lutheran churches of Germany and the northern kingdoms, pictures, crucifixes, and other religious symbols are still freely retained. In many of the parish churches of England these remained till long after the Reformation. Thus, we find that William Dowsing found ample employment during ten months of 1644 in destroying pictures and images in the churches of the single county of Suffolk, in accordance with an ordinance of parliament. In the modern Anglican Church the practice is still a subject of controversy, and the magnificent sculptured reredos erected in St Paul's Cathedral was protested against as idolatrous by some of the London clergy in 1888. In the Presbyterian Church and in all the other Protestant communions images are entirely unknown, although figures of patron saints and eminent churchmen have occasionally been set up, as in the restored St Giles' High Kirk in Edinburgh.

The Roman Catholic Church, through the decree of the Council of Trent, disclaims the imputation commonly made against Catholics of the idolatrous worship of images, 'as though a divinity dwelt in them, or as though we [Catholics] asked anything of them, or trusted in them, as the heathens did in their idols.' It renews the Nicene distinction between *absolute* and *relative* worship; the latter of which alone—'whereby we worship Christ and the saints, who are the prototypes of these images'—it sanctions or permits; and it contends for the great advantage, especially in the case of rude and unlearned people, to be drawn from the use of pictures and statues in the churches as 'memorials of the sufferings and of the mercy of our Lord, as instructive records of the virtues of the saints, and exhortations to the imitation of their example, and as incentives to the love of God and to the practice of piety' (Sess. xxv. *On the Invocation of Saints*). In many foreign churches, especially [illegible] Italy, in southern Germany, and in France [illegible] to be found images which are popularly [illegible] as especially sacred, and to which, or to [illegible] offered before which, miraculous effects are [illegible] But instructed Catholics declare that [illegible] connected with such images form [illegible] Catholic belief. Most Catholic book[illegible] contain cautions against attributi[illegible] to any special virtue of the im[illegible] rather than to the special faith [illegible] fervour which are stirred up by [illegible] by the recorded examples of [illegible] with which they are associated [illegible] the faithful.

**Imago.** See INSECT.

**Imâm,** or IMAUM, the officer [illegible] medan mosques recites the pray[illegible] devotions of the faithful. In [illegible] also performs the ceremonies con[illegible] cumcisions, marriages, and funerals. [illegible] Mohammed and his immediate successo[illegible] title Imâm, because they used personally to [illegible] duct the devotions of their followers. Hence [illegible] title became equivalent to the head of the fai[illegible] and as such is borne by the Sultan of Turkey. For the doctrine of 'the Hidden Imâm,' see ISMAILIS, MAHDI.

**Imbecility.** See IDIOCY.

**Imbros,** or IMBROS, an island of the Ægean Sea, belonging to Turkey, about 14 miles NE. of Lemnos and the same distance W. of the mouth of the Dardanelles. Area, 98 sq. m.; pop. 6000, mostly of Greek descent. The island is mountainous, its highest summit attaining 1959 feet above sea-level. Goats and bees are kept. The inhabitants cultivate the soil and carry on fishing. The chief village, Kastro, is situated on the north coast, and occupies the site of the ancient town of Imbros. It is the seat of a metropolitan of the Greek Church.

**Imeritia,** or IMERETHIA. See GEORGIA.

**Imitatio Christi,** a famous book highly prized by devout Christians of all confessions, and translated into more languages than any book except the Bible. The question of its authorship has given rise to a great controversy. It was formerly attributed unhesitatingly to Thomas à Kempis, and the best authorities still regard it as his work. But it has been claimed for Chancellor Gerson (q.v.), for Gerson, abbot of Vercelli (an apparently hypothetical person), for Walter Hilton, a monk of Sheen in Surrey, for Bonaventura, Bernard of Clairvaux, and for many other writers, both famous and obscure. See KEMPIS (THOMAS À).

**Imitation,** in the science of musical composition, is the repeating of the same passage, or the following of a passage with a similar one, in one or more of the other parts or voices, and it may be either strict or free. When the imitated passage is repeated note for note, and every interval is the same, it is called strict, and it may take place in the unison or octave, or in any other of the degrees of the scale, either above or below the original passage. Canon (q.v.) is strict imitation carried on to some length. The progression of a passage may also be imitated by an inversion, or by reversing the movement of the original; also by notes of a greater or of a lesser value (see AUGMENTATION).

**Imitation.** See MIMICRY.

**Immaculate Conception.** The Feast of the Immaculate Conception of the Blessed Virgin Mary is celebrated on the 8th of December in the Latin, and on the 9th in the Greek Church, in
latter church it is held under the name of
Conception of St Anne,' the mother of the
Mary. The festival of the Conception
raceable in the Greek Church from the
5th century, and in the Latin dates from
t a great controversy prevailed for a
the West as to whether and in what
eption of the Blessed Virgin Mary
naculate, and in what sense the
self was to be held conceived
believed to be a consequence
he divine maternity, and a
honour due to the Incarna-
d Mother should be held to
es free from the stain of sin.
en either by her having been,
miah (Jer. i. 6), or the Baptist
, sanctified before her birth—
other's womb from the stain
the still higher sanctification
y exempted from the stain of
e formation of the embryo
mother, or at least before its
on with the soul. The actual
e West may be said to have com-
St Bernard, who not only remon-
he canons of Lyons in 1131 for their
ised introduction of this festival in their
l, but rejected the opinion of the Blessed
s having been conceived free from original
ough he admitted her sanctification in her
mother's womb. Duns Scotus, in a disputation held before the university of Paris in 1307, maintained the doctrine of the immaculate conception in its highest sense; and the entire order to which he belonged, the Franciscan, as well as the school to which he has given his name, the Scotists, afterwards zealously defended it. The Thomist school, which was that of the Dominican order, denied the immaculate conception, and much division for a time existed; but the prevailing tendency was at all times towards the Scotist opinion. The university of Paris in 1387 condemned the Thomist doctrine. The Council of Basel—although, it is true, at the time when it was in conflict with the pope—declared the doctrine of the immaculate conception to be a Catholic dogma, and reprobated in the strongest terms the opposite opinion. Sixtus IV., however, imposed on the defenders of both opinions in 1470 the obligation of mutual toleration and charity, and renewed this constitution in 1483; but the university of Paris required from doctors graduating an oath that they would defend the dogma of the immaculate conception. The Council of Trent merely declared that 'in its decree on original sin it did not comprehend the blessed and immaculate Virgin Mary,' and renewed the constitution of Sixtus IV. This abstinence on the part of the council led to a further renewal of the dispute, which reached such a pitch towards the close of the 16th century that Pius V. not only prohibited either side from stigmatising the opposite with the name of heretical, but forbade all public discussions of the subject, except in theological disputations in the presence of a learned auditory. In the pontificates of Paul V. and Gregory XV. earnest requests were made by the Spanish crown to obtain a definite declaration in favour of the doctrine of the immaculate conception; but the pope again refused, contenting himself with repeating the constitution of Sixtus IV. He added, however, certain new provisions: (1) That disputants, in asserting the doctrine of the immaculate conception, should abstain from assailing the opposite doctrine. (2) That no one except the members of the Dominican order, and others specially privileged, should presume to defend, even in private disputation, the doctrine that the Blessed Virgin Mary was conceived in original sin. (3) That, nevertheless, in the public mass or office of the church, no one should introduce into the prayers or other formularies any other word than simply *conceptio,* without adding any epithet involving either doctrine. At the same time opinion was setting steadily in favour of the doctrine of the immaculate conception. Alexander VII., and afterwards Clement IX., added new solemnity to the festival. Clement XI. ordained that it should be observed as a holiday of obligation, and at length Gregory XVI. permitted that the epithet immaculate should be introduced into the public service. In the end, at the instance of bishops in various parts of the church, Pope Pius IX. addressed a circular to the bishops of each nation, calling for their opinion, and that of their people, as to the faith of the church on the point; and on the receipt of replies all but absolutely unanimous, he issued a solemn decree at Rome, in a numerous council of bishops, on the 8th December 1854, declaring the doctrine to be an article of Catholic belief, and proposing it as such to the universal church. This decree has been universally accepted throughout the Roman Church.

**Immanence,** the notion that the intelligent and creative principle of the universe pervades the universe itself, a fundamental conception of Pantheism (q.v.).

**Immanuel.** See EMMANUEL.

**Immermann,** KARL LEBERECHT, dramatist and humorist, was born at Magdeburg on 24th April 1796, and educated at his native town and at Halle, where he opposed the duelling *Burschenschaften* (q.v.). In 1817 he entered the public service of Prussia, and, after serving at Münster, Magdeburg, and Düsseldorf, died at the last-named town on 25th August 1840. For twenty years of his life (1819-39) he was greatly influenced by the Countess von Ahlefeldt, an intellectual lady of literary tastes. Immermann began his literary career as an adherent of the Romantic school, and in the spirit of that school wrote the comedies *Die Prinzen von Syrakus* (1821) and *Das Auge der Liebe* (1824), and the tragedies *Das Thal von Ronceval* (1822), *Konig Periander* (1823), and others. His later dramatic works, as the trilogy *Alexis* (1832) and the mythical piece *Merlin* (1831), show more originality and fewer traces of Romantic influence. He failed in an endeavour to make the theatre at Düsseldorf, of which he became director in 1835, a model of classic elegance and healthy influence. His fame rests more enduringly upon his tales (*Miscellen*, 1830) and the humorous, satirical novels *Die Epigonen* (1836) and *Münchhausen* (1839), this last the best known of his works and one of the best of German novels. The idyllic portion of *Munchhausen* has often been printed separately under the title *Der Oberhof*. Besides these he wrote a mock-heroic poem *Tulifantchen* (1827), the epic *Tristan und Isolde* (1842), and *Memorabilien* (1840-43), the last two left incomplete. Collected editions of his works were published in 14 vols. (1840-43), and in 20 vols. by Boxberger (1883). See Life by his widow, edited by G. von Putlitz (2 vols. 1870).

**Immigration.** Under the head of Emigration (q.v.) the causes which have led to immigration and the conditions under which movements of population are conducted have been fully described. It is necessary under immigration (entering or passing into a place, as opposed to emigration) to touch on some features of national opinion and policy which have come into existence within the past few years. Until the last few years, with the exception of the immigration of Huguenot families from France to Great Britain after the revocation of the Edict of Nantes, the population of these islands has not been increased from external sources. Since 1880 a considerable influx of the Semitic inhabitants of eastern Europe, principally Poles, Russians, Roumanians, and Germans, has seriously affected the industrial position of British-born workers in certain trades. Public attention was drawn to the subject in 1888 and 1889 by the appointment of two parliamentary committees—one by the House of Lords on the sweating system, the other by the House of Commons on the question of foreign pauper immigration. These separate inquiries were really directed to the same subject. From the evidence given it appears that the anti-Semitic laws of Russia, Poland, and Germany, aggravated by the hated burden of compulsory military service, have induced considerable bodies of destitute persons, almost exclusively of the Hebrew faith, to seek in England a refuge from civil and religious persecution. Unlike the Huguenots, who brought with them not only capital, industry, and a knowledge of at least two useful trades, silk-weaving and watch-making, the Jewish refugee families arrive in England in a destitute condition. The result of this indigent condition is a willingness to accept the smallest remuneration for the heaviest labour. Sixteen to eighteen hours a day is no unusual period of toil for these pauper immigrants in the boot-finishing trade. The weekly remuneration for this work varies from four to fourteen shillings, according to the skill and industry of the worker. The bearing of these facts on the welfare of British-born workers engaged in the same or in kindred occupations is of a sinister character. Alone of civilised nations Great Britain is without laws to control and if need be check the influx of foreigners, who, contributing nothing to the national revenue, enjoy the privileges without sharing the burdens of citizenship. Public opinion holds jealously to the traditions of hospitality England has always extended to sufferers by foreign persecution. Mazzini, Kossuth, and Orsini found a sanctuary on British soil. It is held that the humbler objects of foreign tyranny shall have no colder welcome measured out to them. The present position of the pauper immigrant question in Great Britain is set forth in the Report of the Select Committee of the House of Commons, 1889, and is to the effect that although no immediate legislation is recommended, the circumstances are such as to require careful watching, with the probability of some restrictive measure being required in the future.

Far otherwise has the question of immigration been dealt with in the United States. By an act passed by congress in 1882 (22 Statutes at Large, chap. 376, p. 214) it is provided that passengers arriving from foreign ports shall be subject to examination. If a convict, lunatic, idiot, or any person unable to take care of himself or herself without becoming a public charge be found on board, such persons shall not be allowed to land. Under this act in the year 1886 the United States returned 996 persons to the port of embarkation. Considering the extent of immigration into the United States, the number is not large; but the liability to repatriation acts as a deterrent to the embarkation of persons likely to come under the provisions of the act. The importation of foreigners and aliens is prohibited in certain cases. By an act passed in 1885 (23 Stats. at Large, chap. 164, p. 332) prepayment for transportation of, or assisting foreign immigrants under contract for labour or service made previous to emigration, is declared to be unlawful. Any contract so made is void and of no effect. Foreigners temporarily residing in the United States are nevertheless permitted to engage other foreigners as private secretaries, servants, or domestics. Nor are persons prevented from engaging as skilled labourers foreigners in any new industry not established in the United States. The provisions of this act do not ap[illegible] to professional actors, artists, lecturers or si[illegible] nor to persons employed strictly as person[illegible] domestic servants, nor do they prevent [illegible] dividual assisting his friends or relativ[illegible] grate to the United States for the [illegible] settlement.

The restriction of the immigration [illegible] into the United States dates from [illegible] of the great trans-continental rai[illegible] abstemious, and industrious, the M[illegible] threatened to lower the wages of [illegible] native-born Americans. The case [illegible] of Chinese includes the following [illegible] they arrive in the country faster [illegible] kind of immigrant; (2) that the n[illegible] is greater than that of any othe[illegible] they are indisposed to be governe[illegible] law; (4) that they are dissimila[illegible] occupation to the English-speaking [illegible] they evade the payment of taxes justly [illegible] government; (6) that they are governed by [illegible] lential habits; (7) that they are useless in cases [illegible] emergency; (8) that they habitually desecr[illegible] graveyards by the removal of bodies therefrom; (9) that the laws governing the whites are found to be inapplicable to the Chinese; (10) that they are inclined to habits subversive of the comfort and well-being of the community; (11) that they do not come as permanent settlers. To carry out the measures for excluding the Chinese a treaty was concluded between the United States and China in 1880, which was proclaimed the following year. The first and most important article of this treaty stipulates that 'whenever in the opinion of the government of the United States the coming of Chinese labourers affects or threatens to affect the interests of that country, or to endanger the good order of the said country, or of any locality within the territory thereof, the government of China agrees that the government of the United States may regulate, limit, or suspend such coming or residence, but may not absolutely prohibit it.' In pursuance of the stipulations in the above treaty congress passed in May 1882 an act declaring that, 'in the opinion of the government of the United States the coming of Chinese labourers to this country endangers the good order of certain localities within the territory thereof,' and it is enacted that the immigration of Chinese labourers be suspended for ten years, and during that time it shall not be lawful for a Chinese labourer to come, or, having come, to remain in the United States. No Chinese are or can be admitted to citizenship. The laws and regulations devised to secure the exclusion of the Chinese are exceedingly stringent. Any person bringing, or causing to be brought, any Chinese person not lawfully entitled to enter the United States is guilty of a misdemeanour, and shall on conviction be fined not exceeding $1000, and imprisoned for not exceeding one year. Masters of vessels arriving at United States ports must supply to the collector of customs a separate list of Chinese passengers on board. Any refusal or wilful neglect to comply with these provisions subjects the master to the penalties provided for refusal to deliver a manifest of cargo.

Public opinion in the United States is by no means unanimous on the Chinese question. The pressure, however, of the Pacific states has been too strong for resistance by the Atlantic states.

With regard to the laws and regulations prevailing in the larger British colonies, space will not permit their being set forth in detail. The following précis of facts and references will be found useful for further investigations of the subject:

Laws or regulations, if any, in the large colonies prohibiting or restricting the immigration of pauper or infirm ons:

ada.—See chap. 65 of revised Statutes of Canada, ons 17 to 24.

*Wales.—No statute.*

Sections 36–39 of Passengers, Harbours, and te, 1865.

—The governor has power under the make rules for repatriating pauper

tute.

3, 49 Vict. No. 4, 1885.

cile Passengers Act, 1882.

ountries respecting the admission e of destitute aliens are contained to parliament in September 1887 swoode).

ustralasian colonies relating to stantially the same as those ited States. See CHINA, Vol. LIES.

, in point of law, is a good defence its, and obligations and contracts ood morals are ineffectual at law. or example, if a man gave a bond, or granted giving to a woman some annuity, with a to induce her to live in concubinage, this ld be a good defence against the bond or deed g enforced, for the law discountenances his conduct; whereas, if it were merely a bond, or a gift, in consideration of something of the same kind past and ended, the deed would be good. So the keeper of a house of ill-fame is not allowed to sue, and has no legal remedy against her guests for any sum agreed to be paid for immoral purposes.

**Immortality** is the continued existence of the human soul in a future and invisible state. 'If a man die, shall he live again?' is a question which has naturally agitated the heart and stimulated the intellectual curiosity of man, wherever he has risen above a state of barbarism, and commenced to exercise his intellect at all. The religion of all civilised peoples may be said more or less to recognise the affirmative of the question, although often under very vague and materialistic forms. Some of the most widely-spread forms of belief in the world would seem to be exceptions to this statement; for in Hinduism the goal sought is absorption into the Universal Spirit, and therefore loss of individual existence; while the pious Buddhist strives for *Nirvana*, or complete extinction. Yet even here the belief in a future life exists in the form of Transmigration (q.v.).

In the ancient Egyptian religion the idea of immortality first assumes a definite shape. There is a clear recognition of a dwelling-place of the dead and of a future judgment. Osiris, the beneficent god, judges the dead, and 'having weighed their heart in the scales of justice, he sends the wicked to regions of darkness, while the just are sent to dwell with the god of light.' The latter, we read on an inscription, 'found favour before the great God; they dwell in glory, where they live a heavenly life; the bodies they have quitted will for ever repose in their tombs, whilst they rejoice in the life of the supreme God.' Immortality is plainly taught, but bound up with the idea of the preservation of the body, to which the Egyptians attached great importance, as a condition of the soul's continued life; and hence they built vast tombs, and embalmed their bodies, as if to last for ever. In the Zoroastrian religion the future world, with its governing spirits, plays a prominent part. Under Ormuzd and Ahriman there are ranged regular hierarchies of spirits engaged in a perpetual conflict; and the soul passes into the kingdom of light or of darkness, over which these spirits respectively preside, according as it has lived on the earth well or ill. Whoever has lived in purity, and has not suffered the *divs* (evil spirits) to have any power over him, passes after death into the realms of light. In the early Greek paganism Hades, or the realms of the dead, is the emblem of gloom to the Hellenic imagination. Achilles, the ideal hero, declares that he 'would rather till the ground than live in pale Elysium.' This melancholy view of the future everywhere pervades the Homeric religion. With the progress of Hellenic thought a higher idea of the future is found to characterise both the poetry and philosophy of Greece, till, in the Platonic Socrates, the conception of immortality shines forth with impressive clearness and precision. In the *Apology* and the *Phædo* Socrates discourses of the doctrine of the soul's immortality in language at once rich in faith and in beauty. 'The soul, the immaterial part, being of a nature so superior to the body, can it,' he asks in the *Phædo*, 'as soon as it is separated from the body, be dispersed into nothing, and perish? Oh, far otherwise. Rather will this be the result. If it take its departure in a state of purity, not carrying with it any clinging impurities of the body, impurities which during life it never willingly shared in, but always avoided, gathering itself into itself, and making the separation from the body its aim and study—that is, devoting itself to true philosophy, and studying how to die calmly; for this is true philosophy, is it not?—well, then, so prepared, the soul departs into that invisible region which is of its own nature, the region of the divine, the immortal, the wise, and then its lot is to be happy in a state in which it is freed from fears and wild desires, and the other evils of humanity, and spends the rest of its existence with the gods.'

It is only in Christianity, however, that this higher life is clearly revealed as a reward, *not* merely to the true philosopher, but to every humble and pious soul. Christ 'hath brought life and immortality to light by the gospel.' 'According to his *abundant mercy, God hath begotten us again* unto a lively hope by the resurrection of Jesus Christ from the dead, to an inheritance incorruptible and undefiled, and that fadeth not away, reserved in heaven.' It is undoubtedly owing to Christianity that the doctrine of the soul's immortality has become a common and well-recognised truth—no mere result of speculation, nor product of priestly invention—but a light to the reason, and a guide to the conscience and conduct. The aspirations of philosophy, and the conceptions of mythology, are found in the gospel transmuted into an authoritative influence, governing and directing the present life. For the development of the idea of a future life in the Old Testament, see the beginning of the article HELL, and see also HEAVEN, ESCHATOLOGY, PRE-EXISTENCE.

**Immortelles.** See EVERLASTING FLOWER.

**I'mola** (anc. *Forum Cornelii*), a picturesque town of Italy, on an islet formed by the river Santerno (*Vatrenus*) in the midst of a fruitful plain, 22 miles SE. of Bologna by rail. Its cathedral has been spoiled by modern restoration. Imola manufactures leather, pottery, silk, and glass, and the vicinity yields abundant wine. Pop. 11,372.

**Impale.** See HERALDRY.

**Impanation** (Lat. *in*, and *panis*, 'bread'), a technical word formed on the analogy of 'incarnation,' employed in eucharistic controversies as early as the 12th century to express the union of the body of Christ with the consecrated bread in the Eucharist; but later specially used of Luther's doctrine of Consubstantiation (q.v.). See LUTHER, and LORD'S SUPPER.

**Impeachment,** an exceptional form of process whereby the House of Commons may obtain redress for any unlawful act, and especially for high crimes and misdemeanours committed by peers and ministers of the crown. When the House has resolved on an impeachment certain of its members are deputed to go to the bar of the House of Lords, and there to present the charges they are prepared to support. At the trial the Lords as a body act as judges, the managers appointed by the Commons conduct the prosecution, and the accused may be defended by counsel. For a picturesque description of these proceedings, see Macaulay's Essay on Warren Hastings. A pardon by the crown may not be pleaded in bar of an impeachment; but after conviction and sentence the crown may pardon the offender. The last instance of an impeachment is that of Lord Melville in 1805. Impeachment is a form of trial, and is to be distinguished from proceedings by way of Bill of Attainder or Bill of Pains and Penalties. Parliament deals with such bills in its legislative and not in its judicial capacity. In the United States impeachment is a written charge brought by the House of Representatives to the Senate against a civil officer of the United States; or, in the several states, the accusation of an officer by the legislature to the senate of the state. The most famous trial of impeachment in the United States was that of President Johnson (q.v.), in 1868; and he was acquitted under the rule requiring a two-thirds vote of the members present to secure a conviction, the vote standing 35 for and 19 against conviction.

**Impenetrability,** one of the essential properties of matter, implies that no two bodies can at the same time occupy the same space. If a nail be driven into a piece of wood, it does not, properly speaking, *penetrate* the wood, for the fibres are driven aside before the nail can enter. If a vessel be filled with fluid, and a solid body be then placed in it, as much water will run over as is equal in bulk to the solid body, in this way making room for it. The lightest gases are really as impenetrable as the densest solid; although, owing to their compressibility, it is not readily made apparent.

**Imperative,** CATEGORICAL. See KANT, and ETHICS.

**Imperial Cities.** See FREE CITIES.

**Imperial Institute.** The Imperial Institute of the United Kingdom, the Colonies, and India, designed to commemorate the jubilee of Queen Victoria (1887), aims at comprising complete collections of the products of the various parts of the British empire, a commercial intelligence department for the promotion of trade and industry, and a great school of modern oriental languages (opened in 1890). In 1890 some £450,000 had been subscribed for the purpose, at home, in Canada, Australia, and India; and the foundation of a building costing £300,000 was laid by the Queen in 1887. See *Magazine of Art* (March 1890).

**Imperialism,** in its original, and, perhaps, its widest sense, was expressed in the great designs of Charlemagne (q.v.). Regarded thus, it amounts to a scheme of undisputed sway over an extensive area of unbroken territory—autocracy on a grand scale. In that sense we find imperialism in the traditional policy of the czars of Russia—a policy which is supposed to imply continuous expansion to the east. But imperialism, as it came to be known in connection with Germany, does not imply conquest or aggression or annexation of territory. In Germany the policy sprang from the Franco-German war, or rather from the events preceding it, and it meant simply the union, or reunion, of the several German states and peoples under one head for purposes of offence and defence, and for certain fiscal and political purpos [illegible] As applied in the affairs of the United Kin [illegible] we find imperialism with a twofold signifi [illegible] It has been in use for a comparatively f [illegible] – since about 1878 or 1879 and is usu [illegible] to Lord Beaconsfield (q.v.). That sta [illegible] credited with large dreams of empire [illegible] crown, and one of his most memor [illegible] have the Queen proclaimed Empre [illegible] connection with the British em [illegible] perialism may, however, be use [illegible] interests of all the members [illegible] mother-country, the colonies, a [illegible] as distinguished from purely na [illegible] local concerns. The character a [illegible] British imperialism are express [illegible] coherently in the schemes of th [illegible] tute and the Imperial Federa [illegible] COLONY). The term 'Imperia [illegible] now applied to the legislature [illegible] is another expression of the same se [illegible] ABSOLUTISM, AUTOCRACY, CHAUVINIS [illegible]

**Impetigo Contagiosa,** a disease of the [illegible] It consists of crops of pustules, which may ei [illegible] be scattered or collected in groups. These pustu [illegible] burst, dry up, and become covered with scabs [illegible] crusts of a yellow colour, not unlike little masses of candied honey. From beneath these crusts a purulent discharge commonly exudes; the crusts become thicker and larger, and the skin beneath them is red and raw. The disease is most common in childhood, and generally arises in ill-fed, ill-cared-for children; but it may be transmitted by contact to adults. The head and face are most commonly affected. Local treatment consists in removal of the crust by poulticing, and the application of white precipitate ointment. Attention must be paid to the general health; cod-liver oil and other tonic medicines are often desirable.

**Impey,** Sir Elijah, born in 1732, was educated at Westminster, brought up to the bar, and sent out to Bengal as the first chief-justice appointed under the Regulating Act of 1773. He landed in Calcutta, 19th October 1774, in company with his brother judges and the three members of council sent out from England under the same act. From the first Impey acted in harmony with the governor-general, Warren Hastings (q.v.); and in the following year presided at the trial of Maharaja Nand Kumar (Nuncomar), charged with forgery. Impey conducted the trial with fairness and patience; the prisoner, however, was found guilty by the jury, after an impartial charge by the chief-justice, who sentenced him to death with the concurrence of a full court. In 1777 Impey was referred to as arbitrator between Hastings and General Clavering when the latter claimed the reversion of the post on Hastings' alleged resignation. Impey pronounced in favour of Hastings; thereby—as the governor-general afterwards acknowledged—saving his fortune, honour, and reputation. In 1779, however, a conflict occurred between the government and the court on a question of jurisdiction, which was only appeased by Impey accepting the chiefship of the Company's courts in addition to his own duties. *In 1783 Impey was recalled, and impeached* for his conduct in the case of Nuncomar. He was honourably acquitted; Pitt and Dunning and Thurlow all concurred in approving the whole of his conduct. In his retirement he continued to enjoy the friendship of good men. In 1803 he visited Paris, and was for a short time detained by the French government in consequence of the rupture of the peace of Amiens. He died in his house at Newick, near Brighton, 1st October 1809. Impey was a good scholar, both classical and oriental; as a judge he was industrious and free corruption. His faults were vanity and a to obsequiousness.

stings; *Life of Sir E. Impey,* by his son, E. B. 46); *The Story of Nuncomar,* by Sir J. F. 35); and Mill's *British India.*

See Pheasant.

native name of Manipur (q.v.).

of the names of Sorghum or Durra

Scotch law, means fulfilment e of the court.

e Atrium.

**Substances,** an epithet t, electricity, and magnetism ey were universally considered distinction to those substances ible weight. See Heat.

**Exports.** See Balance of on Great Britain and other

See Marriage.

**g.** See Pound.

**ism,** the term applied to a modern of art which, originating in France, is ly held to have been founded by Edouard t, and of which Claude Monet, Degas, Renoir, ro, Sisley, and De Césane are the best-known bers. The impressionists may be said to have appeared before the public in the special exhibition of the works of Manet and his followers which was held in Paris in 1867; and in 1874 and 1876 collections of their works were brought together in the Boulevard des Italiens and in the galleries of Durand Ruel, who in 1882 organised an exhibition of their productions in London; while a series of works by Monet were shown in 1889 in the Goupil Gallery, London. The aim of the impressionists is to rid themselves of the trammels of artistic tradition, and to look at nature—and portray her—in a fresh and original manner. They therefore strive to avoid such compromises and conventionalities of lighting, composition, &c. as have been frankly accepted by the art of the past, and to render with absolute truth their personal and immediate 'impressions' of nature. The members of the school accordingly separate themselves from the great so-called 'romantic' art of the last generation in France —the art of men like Corot, Decamps, Rousseau, and Daubigny—which is a legitimate and orderly development of the mighty art of the past; and—though they have more kinship with these—they are also to be distinguished from the *plein-air* painters of modern France, at whose head stands Bastien Lepage, and whose main aim is a careful and strictly scientific accuracy in their relative tones of colour. In their rejection of tradition and desire for a fresh, unconventional rendering of nature the impressionists are at one with the pre-Raphaelites of England; but, while the latter studied nature in a severely detailed and analytical manner, the former look on her in her large relations, and portray only such of her salient features as are visible on a cursory examination, and these they render by brushwork of the slightest, thinnest, and loosest description. From the pre-Raphaelites the impressionists are still more definitely separated by their want of care for intellectual or emotional interest in their pictures. In the words of one of their ablest exponents, they hold that the eye of the painter 'should abstract itself from memory, seeing only that which it looks upon, and that as for the first time; and the hand should become an impersonal abstraction, guided only by the will, oblivious of all previous cunning.' In the works of most of the impressionists little selection of subject or care for beauty of colour, form, or expression is visible; and their art, touching as it would seem by an instinctive preference on some of the most unlovely aspects of 19th-century existence, dealing with the life of the jockey and the ballet-girl, and portraying the worst atrocities of modern costume, has frequently fallen into dire depths of ugliness and vulgarity. Certain points of resemblance to the aims and methods of the impressionists are to be found in the works of such able painters as J. M. Whistler and J. S. Sargent, and still more distinctly in those of several of the younger Paris-trained English painters who have exhibited in the Suffolk Street Gallery and in the Nineteenth Century Art Club. In 1889 several young English painters, styling themselves 'London Impressionists,' and including B. and W. Sickert, T. Roussel, P. W. Steer, and Francis Bate, held an exhibition in the Goupil Gallery, London; and a pamphlet by the last-named painter—*The Naturalistic School of Painting* (2d ed. 1887)—contains the best exposition of the aims of the English section of the school.

**Impressment.** See Pressgang.

**Imprint.** See Book, Vol. II. p. 303.

**Imprisonment.** Imprisonment is one of the three classes of punishment for crime, death and penal servitude being the other two. Under certain statutes the punishment of whipping also may be adjudged to juvenile offenders or persons convicted of assaults with violence. It has always been a power inherent in courts of justice to imprison for contempt of their authority, and until lately for non-payment of debt. In criminal proceedings a person may, by a warrant of a justice of peace or magistrate, be imprisoned before trial, provided the justice considers it is not a proper case for allowing bail; and though in minor offences an accused person may insist on being discharged on tendering sufficient bail, yet in more serious crimes it is in the discretion of the justice to accept or refuse the bail tendered, and on his refusal application may be made to judges of the common law courts to accept bail. In Scotland, when such review is resorted to under the Criminal Procedure Act of 1887, or the Act to amend the Law of Bail, 1888, the court as a general rule leaves the prosecutor's discretion as to bailability untouched, and in England the same rule obtains. In both countries the supreme courts will interfere where the question is merely one of amount, or where malice or oppression on the part of the prosecutor is averred; but in Scotland, owing to the system of official as distinguished from private prosecution, such grounds are rarely advanced in support of an application for bail. Imprisonment may be with or without hard labour, or it may be solitary. Every prisoner sentenced to undergo a long term passes a period in solitary confinement, and it is in the power of prison governors to order a return to this, which is considered the hardest part of the term, for any gross breach of discipline. The statutory limit of imprisonment is two years. Penal servitude may be inflicted for life, or any shorter term, but in the case both of imprisonment and penal servitude the convict can at any time, and repeatedly within certain limits, apply to the Home Secretary in England, and to the Scottish Secretary in Scotland, for commutation or remission. The documents are forwarded to the judge who tried his case, and the secretaries are guided in their decision by the report which the judge furnishes. In the general case a fourth or a third is deducted from all terms of penal servitude as a matter of course where the convict has complied with prison rules. In police and other petty offences tried summarily at common law and under a variety of statutes, imprisonment is usually awarded with the option of a fine (discretionary in amount), excepting the case of theft; but all other offences tried before recorder and quarter sessions in England and the sheriff and jury in Scotland are visited with imprisonment, although in a few isolated examples statute gives an option. The unlawful detention of the person by any one, or 'false imprisonment' (in Scotland, 'wrongous'), constitutes a personal injury, and may be treated as a criminal or as a civil offence. When persons tried and convicted are afterwards proved to have been innocent, compensation may be awarded to them, along with a formal 'pardon.'

The subject of imprisonment for debt is discussed at Debt, Vol. III. p. 717.

**Improper House.** See Nuisance.

**Impropriation,** the transfer to a layman of the revenues of a benefice to which the cure of souls is annexed, with an obligation to provide for the performance of the spiritual duties attached to the benefice. The practice of *impropriation* differs from the somewhat similar but more ancient usage of *appropriation*, inasmuch as the latter supposes the revenues of the appropriated benefice to be transferred to ecclesiastical or quasi-ecclesiastical persons or bodies, as to a certain dignitary in a convent, a college, a hospital; while impropriation implies that the temporalities of the benefice are enjoyed by a layman. The practice of impropriation, and still more that of appropriation, as in the case of monasteries, &c., and other religious houses, prevailed extensively in England before the Reformation; and on the suppression of the monasteries all such rights were vested in the crown, and were by the crown freely transferred to laymen, to whose successors in title they have passed by descent and purchase. The spiritual duties of such rectories are discharged by a clergyman, who is called a vicar, and who receives a certain portion of the emoluments of the living, generally consisting of a part of the glebe-land of the parsonage, together with what are called the 'small tithes' of the parish. A lay impropriator is rector of the parish; as such he has rights over the chancel of the church, and is bound to keep it in repair.

**Improvisatori,** an Italian term, designating poets who without previous preparation compose on a given theme, and who sometimes sing and accompany their voice with a musical instrument. The talent of improvisation is found in races in which the imagination is more than usually alert, as among the ancient Greeks, the Arabs, and in many tribes of negroes. In modern Europe it has been almost entirely confined to Italy, where Petrarch, in the 12th century, introduced the practice of singing improvised verses to the lute; and down to the present day the performances of improvisatori constitute one of the favourite entertainments of the Italians. Far inferior to these are such improvisations as those of Theodore Hook, wonderful as they were. Women have frequently exhibited this talent in a high degree. Improvisation is by no means limited to brief poems of a few verses and of very simple structure, but is often carried on with great art, and in the form and to the length of a tragedy or almost of an epic poem. But such productions when printed have never been found to rise above mere mediocrity. It is worthy of notice that the greater number of the celebrated improvisatori of Italy have been born in Tuscany or the Venetian territory. Siena and Verona have been especially productive of them. Some of the principal are Serafino d'Aquila (1466-1500), Perfetti (1680-1747), Metastasio (q.v.), who soon abandoned the art, Zacco (died 1764), Serio and Rossi (both beheaded at Naples in 1799), Gianni (pensioned by Bonaparte), and Tomma[illegible] Sgricci (1798-1836). The best-known *improv*[illegible]*trices* are Maddalena Morelli Fernandez, also [illegible] Corilla Olimpica, the original of Madame de [illegible] *Corinne* (died 1800), Teresa Bandettini [illegible] 1837), Rosa Taddei, Signora Mazzei (p[illegible] first in point of talent), and more [illegible] Sicilian Giovannina Milli.

**Imputation** is one of the most [illegible] nical expressions in Christian [illegible] meant to denote the transferen[illegible] merit of punishment or reward [illegible] the imputation of sin, for exampl[illegible] which inculcates that all manki[illegible] the fact and consequences of [illegible] innocence; and the correlative [illegible] imputation of Christ's righteousn[illegible] inculcates that the merit or right[illegible] is transferred to those who beli[illegible] other words, that they become sha[illegible] or righteousness. See Covenant, A[illegible]

**Inaccessible Island.** See Tri[illegible] Cunha.

**Inagua.** See Bahamas.

**Inanition.** See Fasting.

**Inarching.** See Grafting.

**In Articulo Mortis**—i.e. at the moment of death, a legal phrase used in connection with the execution of deeds by persons at the point of death. See Will.

**Incandescence.** The hotter a body the greater the disturbance which its particles, always oscillating, set up in the surrounding ether, and the greater is the proportion of ether-waves of short length which are set up. Thus, as a body becomes progressively hotter it first becomes visible in the dark as a fog-gray object (platinum at 390° C., gold at 417° C., and iron, not quite free from rust, at 377° C.—H. F. Weber), then ash-gray, then yellowish-gray, then faintly red, then red hot, orange, yellowish-white, white hot, and lastly, when there is at very high temperatures a preponderance of the more refrangible rays, it becomes bluish or even distinctly blue, as it seems the sun would appear were it not for our atmosphere (Langley). Incandescence is usually witnessed in solids; in liquids it is not known by sight; in gases we have examples in the hydrogen flame and in the condition of the air traversed by lightning or the electric arc. For Incandescent Electric Lamps, see ELECTRIC LIGHT.

**Incantation,** a formula of words said or more frequently sung in connection with certain ceremonies for purposes of enchantment. The use of such is a persistent feature in sorcery from the earliest times, and we still find them used among savage peoples as spells or charms efficacious for the healing of sickness and the averting of danger, as well as for bringing on rain or invoking any other blessing that is much desired. No less common are malignant spells by means of which evil deities are induced to send sickness or death upon enemies, the darker and malignant side of magic being ever as present to the primitive mind as the beneficent. Such traditional formulas show a marvellously conservative fixity of form—a proof, if such were needed, of their real unreality and practical inefficiency, and that the whole has at no time been other than a dark and blind appeal to unknown forces, without the slightest glimmering of scientific ratiocination, and capable of no improvement. For the same reason ancient or foreign epithets, and terms not merely misunderstood but not understood at all, are often found to have been particularly efficacious, and we find medieval
ers in their formulas using transposed letters
ificial words, the traditional Jewish names
s, as Asmodai and the like, and a gibberish
Hebrew and Greek words more or less
confused. Even so late as 1830 in
two Gypsy girls were found using a
tion in the process of their fortune-
istory of such words as the
.v.) and the medieval *Abracad-*
reat light on the methods of
earliest ages down to the
rdities disappeared before the
ific method. But it was not
ss civilised peoples that such
tations was made. In ancient
rked into an elaborate system
y formulas of such religious
Again, the Babylonians had
formulas by means of which
pelled the malignant demons
them. In the *Vedas* we con-
*ntras*, corresponding exactly
of the Redskins and the
he Maoris. In the *Odyssey* the
ysseus sing 'a song of healing' over
given him by the boar's tusk. In the
again we find the song that salves
and nothing is more common in our
traditional folk-tales than the most
niracles wrought by the repetition of
f rhyme. But indeed such traditional
e by no means yet extinct in the corners
t civilised countries, used along with the
and more legitimate methods of healing,
ey even have a defensible use in the soothing effect that an act of faith has upon a simple mind. Thus in Shetland, according to a writer in the *New Statistical Account of Scotland*, 'when a person has received a sprain it is customary to apply to an individual practised in casting the "wresting-thread." This is a thread spun from black wool, on which are cast nine knots, and tied round
sprained leg or arm. During the time the operato
is putting the thread round the affected limb, h
says, but in such a tone of voice as not to be hear
by the bystanders, nor even by the person operated
upon:

The Lord rade, and the foal slade;
He lighted, and he righted.
Set joint to joint, bone to bone,
And sinew to sinew,
Heal, in the Holy Ghost's name.'

**Incarnation,** the usual theological term for the union of the divine nature with the human in the divine person of Christ. The word *incarnatio* first occurs in the Latin version of Irenæus, and in the Greek fathers we find its equivalent *sarkosis* and *enanthrōpēsis* (St Ambrose's *humanatio*). See CHRIST, and JESUS.

**Incas.** See PERU.

**Incense,** a perfume, the odour of which is evolved by burning, and the use of which in public worship prevailed in most of the ancient religions. The incense at present in use consists of some resinous base, such as gum olibanum, mingled with odoriferous gums, balsams, &c. There is no regular formula for it, almost every maker having his own peculiar recipe. The ingredients are usually olibanum, benzoin, styrax, and powdered cascarilla bark. These materials, well mingled, are so placed in the censer or thurible as to be sprinkled by falling on a hot plate, which immediately volatilises them, and diffuses their odour through the edifice.

In the Catholic Church, both of the West and of the East, incense is used in public worship, more particularly in connection with the eucharistic service, which is regarded as a sacrifice: but such use is implicitly condemned by Tertullian, Lactantius, Augustine, &c., and seems not to have established itself till the 6th or at least the 5th century. In the Roman Catholic Church incense is used in the solemn (or high) mass, in the consecration of churches, in solemn consecrations of objects intended for use in public worship, and in the burial of the dead. There are also minor incensations of the celebrating bishop or priest and inferior ministers; of prelates, princes, and other dignitaries officially present at the public service; and a general incensation of the whole congregation.

In the Reformed churches the use of incense was abandoned at the same time with other practices which have been laid aside by them as without 'warrant of Scripture;' it has, however, been revived by some of the Ritualists. See CENSER, FRANKINCENSE.

**Incest** (Lat. *in*, 'not,' and *castus*, 'chaste') is the marrying of a person within the Levitical degrees. In the old ecclesiastical law (now obsolete), and in Scotland, it comprehends cohabitation irrespective of marriage. The law of England, as declared by statutes passed in the reign of Henry VIII., forbids marriage within the prohibited degrees (see CONSANGUINITY). A marriage between a widower and his deceased wife's sister comes within these rules, and is void, and it makes no difference that the marriage was celebrated in a foreign country, as, for example, Denmark, in the United States, or in one of the British colonies, where these marriages are legal, if the parties were domiciled in England, and went abroad merely to evade the English law. It has also been decided in England that the same rules which apply between legitimate relations apply between natural relations, though one is legitimate—as, for example, between a man and the daughter of an illegitimate sister of his deceased wife. Though incestuous marriages are utterly void in England, still it is not a criminal offence to marry incestuously, not even in those cases in which the connection is most abhorrent to the moral sense of mankind, and the remedy in the ecclesiastical courts may be considered obsolete. In Scotland incest, which is calculated on the same grounds, not only makes a marriage void, but the better opinion is that to marry incestuously, as well as to commit incest, is a capital offence. See MARRIAGE.

**Inch,** a Gaelic word, corresponding to Irish *innis*, and signifying Island (q.v.); the same root appears in Lat. *ins*-ula. Inch and Innis enter into many compounds, as Inchmahome (an island in the Lake of Menteith), Inniscattery (an island in the estuary of the Shannon), &c.

**Inchbald,** ELIZABETH, actress, dramatist, and novelist, was the daughter of John Simpson, farmer at Standingfield, Bury St Edmunds, where she was born on 15th October 1753. While quite a girl she determined to become an actress, and when only eighteen left her home to seek a theatrical engagement in London. After a series of strange adventures she betook herself to her relations in London, and with them she met Joseph Inchbald, an obscure actor, whom she married on 9th June 1772. She then went to Bristol, where she made her *début as Cordelia on 4th September 1772;* and for some years she played in provincial theatres. Her husband died suddenly in 1779, and in 1780 (3d October) she appeared in London, playing Bellario in *Philaster*, at Covent Garden. Here she remained for nine years, but never rose beyond mediocrity, an impediment in her speech, which was, however, supposed to be cured, being certainly a bar to her progress. But before she left Covent Garden, in 1789, she had found her true vocation—literature, and to it she devoted herself till her powers began to fail. Her earliest efforts were plays, her first being *The Mogul Tale*, a farce produced in July 1784. She wrote or adapted nineteen plays, her best being the comedies of *Such Things are* (1787), *The Midnight Hour* (1787), and *The Wedding Day* (1794); the farces of *Appearance is Against Them* (1785) and *The Widow's Vow* (1786); and her adaptation from Kotzebue, *Lovers' Vows* (1798). She edited the well-known *Inchbald's British Theatre* (25 vols.), a *Modern Theatre* (10 vols.), and a Collection of Farces (7 vols.). But her fame rests not upon her dramatic work so much as upon her novels, *A Simple Story* (1791) and *Nature and Art* (1796), which rank among English standard novels. Mrs Inchbald, who was a Catholic, became very devout in her later years, and died at Kensington House (then a Catholic establishment), 1st August 1821. Her biography by Boaden (2 vols. 1833) is one of the most cumbrous and ill-digested even of that writer's productions. She wrote an autobiography, but destroyed the MS. by the advice of her spiritual director. See the Memoir by William Bell Scott prefixed to a new edition of *A Simple Story and Nature and Art* (1880).

**Inchcape.** See BELL ROCK.

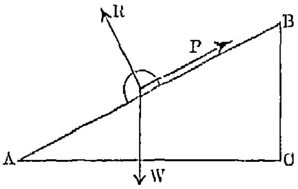
**Inchcolm,** and **Inchkeith.** See FORTH.

**Incidence,** ANGLE OF. See OPTICS.

**Incledon,** CHARLES BENJAMIN, singer, was born at St Kevern, Cornwall, in 1763, was admitted to the choir of Exeter Cathedral at the age of eight, and served in the navy from 1779 to 1783. His voice was now a fine tenor, and in 1784 he made his first appearance at the Southampton Theatre, as Alphonso in the *Castle of Andalusia.* From 1786 to 1790 he sang in the summer at Vauxhall Gardens, and in the winter at Bath. In September 1790 he appeared at Covent Garden Theatre as Dermot in the *Poor Soldier;* and for twenty-five years thereafter he remained unrivalled as a ballad singer. In 1817 he visited America. Afterwards he travelled through Britain under the style of the 'Wandering Melodist;' and he died at Worcester, 11th February 1826. Incledon's singing was bold and manly, at times full of feeling; his best ballads were such as 'Black-eyed Susan,' 'The Arethusa,' and 'The Storm,' which he sang dressed as a sailor.

**Inclination,** or DIP. See MAGNETISM.

**Inclined Plane,** THE, is reckoned one of the mechanical powers, because, by rolling it up a plane, a man may raise a weight which he could not lift. Let us suppose a plane as in the figure: let its length, AB, its height, BC, and its base, CA, be respectively 13, 5, and 12 feet; and let a rolling load of 780 lb. be placed upon it and sustained in position by a pull or push acting up the plane. We have now three forces in equilibrium: (1) the weight, W, of the body; (2) the resistance, R, *of the plane to bending or breaking; and (3) the* pull, P, up the plane. These, W, R, and P, are respectively proportional to the length, AB, the base, CA, and the height, BC; and are thus, in the case supposed, respectively 780, 720, and 300 lb. A force which would, if applied vertically, just lift 300 lb., will thus keep a rolling mass of 780 lb. in position upon a smooth inclined plane, the *gradient* of which is 5 (height) in 13 (sloping length); and a force exceeding this would pull the mass up the slope. In every practical case, however, there is a certain force expended in overcoming Friction (q.v.), even on a dead level; in railwa [illegible] trains this is equivalent to vertically lifting al [illegible] 50 lb. for every ton of dead weight; and wh [illegible] train leaves a level run to go up a slope of [illegible] in 80, the engine has then, for every ton of [illegible] *to do work equivalent to vertically lif* [illegible] $+ \frac{1}{80}$ ton = 78 lb., instead of the form [illegible] steeper the gradient, therefore, the hea [illegible] and engineers, in roadmaking, av [illegible] possible making steeper slopes tha [illegible] inclined plane presents various m [illegible] as knives, chisels, axes, wedges [illegible] two are generally reckoned as dis [illegible] powers, and will be treated eac [illegible] head.



**Inclosures.** See COMMONS.

**In Cœna Domini,** a celebr [illegible] so called from the ancient day of [illegible] cation, Holy Thursday. It is not [illegible] the work of a single pope, but, with [illegible] modifications at various times, dates [illegible] middle ages. Its present form, however, is rec [illegible] from the popes Julius II., Paul III., and fin [illegible] Urban VIII., in 1627, from which year it contin [illegible] for a century and a half to be published annual [illegible] on Holy Thursday. It may be briefly described as a summary of ecclesiastical censures, especially of those with which grievous violation of the faith of the church, or of the rights of the church or of the Roman see, are visited; excommunication being denounced against heresy, schism, sacrilege, usurpation of the rights of the church or of the pope, forcible and unlawful seizure of church property, personal violence against ecclesiastics, &c. The bull also denounces other crimes, as piracy, plunder of shipwrecked goods, and forgery. This bull, being regarded by most of the crowned heads of Europe as an infringement of their rights, encountered in the 17th century the determined opposition of nearly all the courts, even the most Catholic; and at length, in 1770, Clement XIV. discontinued its publication, which has never since been renewed.

**Incombustible Fabrics.** See FIRE.

**Income-tax,** a tax directly levied on all persons having incomes above a certain amount. We hear of a tax imposed on property and *incomes* by the English parliament in 1642 during the great Civil War. It became an important feature in the fiscal system under the younger Pitt during the great French war in 1798. It was revived by Sir Robert Peel in 1842, and may now be regarded as a permanent item in taxation. At present all incomes in Britain under £150 are totally exempted from the tax, while, as regards incomes under £400, £120 is deducted, and then the remainder taxed. See GREAT BRITAIN, Vol. V. p. 376.

With reference to the equity and reasonableness of the income-tax opinion is divided. The tax is graduated so far; considerations of equity are satisfied by exempting from it an income sufficient for a decent and comfortable maintenance. On the other hand the tax certainly bears an inquisitorial character through the officials of government making investigation into the private affairs of the citizens. Further, as the estimate of income must to a large extent be left to the discretion of the persons taxed, it offers very considerable opportunity for concealment and falsification in the returns; while the conscientious render an account in full, the less scrupulous may pay less than they ought. Also, it is not equitable that incomes gained from hard industrial or professional labour should be taxed as heavily as incomes derived from inherited property. Such considerations have long and vigorously been urged against the income-tax, and it must be
itted that there is much force in them; but
is little prospect of argument taking effect in
lition of the tax. An increase of income-
he great resort of government in times of
y, particularly during war, or when the
r makes special armaments necessary.
Goschen estimated that every penny
tax meant an addition of about
he revenue (as compared with
under Peel). It is all the more
n indispensable, because taxa-
in is now limited to a very
ily consumption, so that the
erwise only narrow scope for
ue. And, apart from the diffi-
t, it must be maintained that
xing the citizens according to
deducting the minimum neces-
le living, is perfectly equitable

es an income-tax was imposed
It was exempted at first on
000, and ultimately on $2000.
000 paid 5 per cent., those between
00, 7 per cent., and all above
cent. The amount received from
varied greatly, as the limit of exemption
sed: in 1866 it reached $61,000,000; in
was only $27,418,000.

**ommensurable.** See COMMENSURABLE.

**rement,** UNEARNED, is the increase in the
t of land due to the growth of industrial undertakings and of towns, and the general progress of society. Because obtained without exertion or the expenditure of capital on the part of the owners of the land, some economists maintain that it should be specially taxed.

**Incubation,** THE PERIOD OF, during which birds sit on their eggs before the young are hatched varies in different species, but is nearly constant in each. In the humming-birds it is only 12 days; in canaries it is from 15 to 18 days; in the raven and in the common fowl it is 21 days; in the duck it is from 28 to 30 days; in the pheasant and in the guinea-fowl it is 28 or 29 days; in the turkey, 30 days; and in the swan, from 40 to 45 days. The degree of heat (about 40° C., 104° F.) necessary for the development of the young is usually supplied by the mother-bird; but in some cases the sunshine (as in ostriches during the day), or the warmth of a nest of decaying plants (as in the Megapodes), is relied upon; nor must it be forgotten that in many Passerine and Running Birds the males take their share, or it may be the entire responsibility of incubation. While the patience of incubation is most emphasised and rewarded among birds, hints of it appear in reptiles—witness the female python; and analogous processes are seen in a few amphibious fishes, and even Invertebrates.

Incubators, or devices for artificial hatching, are used both for practical and scientific purposes at the poultry farm and in the embryological laboratory. From time immemorial the Egyptians have hatched eggs by artificial warmth in peculiar but comparatively simple ovens, and thirty millions of chickens per annum are said to be thus hatched in Egypt. In 1777 Bonnemain devised a hatching apparatus which supplied the Parisian markets with poultry. In 1825 D'Arcet obtained chickens from artificial incubation by means of the thermal waters at Vichy. The *Eccalcobion*, invented by Mr Bucknell, was said to possess a perfect control over temperature from 300° F. to that of cold water for any length of time. The modern incubator consists essentially of a large water-bath and a gas regulator for automatically preventing the rise of temperature above 40° C. The eggs are placed in a tray or drawer, so arranged that the products of the gas combustion are kept away from the eggs, but a supply of fresh air and moisture secured. For embryological purposes the form most used in Great Britain is probably that of the Cambridge Scientific Instrument Company. See OSTRICH-FARMING, POULTRY; also PISCICULTURE.

**Incubus.** See DEMONOLOGY.

**Incumbent,** the rector, parson, or vicar holding an ecclesiastical benefice in England. It is the common title in Scotland of episcopal clergymen holding charges.

**Incumbered Estates.** See ENCUMBERED.

**Incuna'bula.** See BIBLIOGRAPHY, Vol. II. p. 132.

**Indecent Exposure** is a criminal offence both at common law and in England and Ireland also by statute. It is not clearly settled whether more than one person must have witnessed the indecency in order to make it an offence. The exposure must be in some public place—i.e. in a place which may be seen by some considerable number of persons. The offence is punishable summarily by three months' imprisonment. In Scotland indecent practices are also indictable offences, but the law in this respect is somewhat vague, and the punishment is left to the discretion of the court.

**Indemnity,** an instrument or contract whereby a person is protected against loss, or against the risk of legal proceedings. Fire insurance, for example, is a contract of indemnity; not so life insurance, which is a contract, not to make good an uncertain loss, but to pay a certain reversionary sum. Acts of indemnity are sometimes passed by parliament for the protection of public officers; thus, in 1801 and in 1817 acts were passed to protect officers who had taken part in the apprehension, &c. of persons suspected of treason. From the year 1727 onward general acts of indemnity were passed from time to time for the benefit of those who omitted to take the oaths of office required by the acts imposing disabilities on dissenters.

**Indented.** See HERALDRY, Vol. V. p. 663.

**Indenture,** the technical name given in England to a deed under seal, entered into between two or more parties with mutual covenants. Formerly the papers or pieces of parchment on which the duplicate copies of the indenture were executed required to be actually indented—i.e. notched or toothed (Lat. *dens*, 'tooth'), or cut in a waving line, so as to correspond with each other, but this is no longer necessary. The name is not used in a general sense in Scotland, except in the case of indentures of Apprenticeship (q.v.).

**Independence Day,** in the United States, falls on the 4th of July, and is observed as a legal holiday. Public meetings are held, orations are delivered, and the general patriotism finds vent in processions and in salvos of artillery, the explosion of crackers, and in displays of fireworks. In the large cities accidents have been not unfrequent, and the reckless discharge of firearms is now kept in check. On July 4, 1776, the Declaration of Independence was reported to the continental congress by the chairman; it was read and proclaimed at the state-house on July 8; but it was not signed by all the delegates until August 2, some of them having to wait for instructions from their respective colonies.

**Independents,** or CONGREGATIONALISTS. The distinctive principle of the Congregational church polity is that every Christian church or congregation is entitled 'to elect its own officers, to manage all its own affairs, and to stand independent of, and irresponsible to all authority, saving that only of the Supreme and Divine Head of the Church, the Lord Jesus Christ.' They regard the Sacred Scriptures as their only standard, and hold that human traditions, fathers and councils, canons and creeds possess no authority over the faith and practice of Christians. Congregationalism denies that there is any authority in Scripture for uniting the churches of a nation or province into one church or corporation to be ruled by a bishop or bishops, superior to the bishops or pastors of particular congregations, or by a presbytery or synod consisting of the pastors or elders of the several congregations of the nation or province. This is the speciality which distinguishes Independency or Congregationalism from Episcopacy and from Presbytery. The term 'Independent' is supposed to have originated in the incidental use of the word in an 'apology' addressed in Latin and English to the British and Continental universities about the year 1604. But the early maintainers of this form of church government were careful to repudiate certain inferences which might be drawn from the use of the word. 'We do profess dependence,' said one of them, 'upon magistrates for civil government and protection; dependence upon Christ and his word for the sovereign government and rule of our administrations; dependence upon the counsel of other churches and synods when our own variance or ignorance may stand in need of such help from them.' The independence claimed was only the right of every individual church to administer its own affairs, free from the control or authoritative jurisdiction of other churches—a right compatible, it was asserted, and is still asserted, with union for the promotion of common ends, and with fraternal aid and counsel in cases of variance or other difficulty. As compared with other societies of Christians who claim spiritual and ecclesiastical independence, this body of Christians may be defined briefly as independent congregationally, or as 'Congregational Independents.'

*Doctrinally* the early Independents occupied the same position as the other sections of the Puritan family. They held in substance the evangelical doctrines of the Reformers, of the Westminster Assembly, and of the Thirty-nine Articles. Not refusing to confess their faith with the other members of the Westminster Assembly, the representatives of the Independents disputed the right of that or any other assembly to confess its faith for posterity, or make that confession binding upon them. Largely Augustinian and Calvinistic in their interpretation of Scripture, Congregationalists have in these later years become more alive to the freedom which their principles involve to interpret Scripture, not according to any one scheme or system, but as loyalty to the light of truth and the spirit of Christianity may dictate. In the reaction which followed the rise of Socinianism many Independent societies fettered the use of their property by the insertion of uncatholic doctrinal restrictions in their deeds. In later years the use of their property and buildings has been limited only to the catholic interpretation of the teaching of Christ, and what they regard as the New Testament constitution of the religious society.

For the history of this body we must refer to the works named at the end of this article. But it may be mentioned that as early as the days of Queen Elizabeth it was numerous and influential. In a speech made by Sir Walter Raleigh in the House of Commons in 1592, on the subject of a law to transport the Brownists—as they were offensively and untruly named after Robert Browne (q.v.)—he thus refers to their numbers: 'If two or three thousand Brownists meet at the seaside, at whose charge shall they be transported? or whither will you send them? I am sorry for it, but I am af[illegible] there is near twenty thousand of them in En[illegible] and when they are gone, who shall maintai[illegible] wives and children?' Several eminent me[illegible] body suffered death for their opinions; [illegible] condemned to banishment. The greate[illegible] to Holland. Numbers sought an a[illegible] England; and America still cherish[illegible] of the Pilgrim Fathers, as the f[illegible] institutions which are the sourc[illegible] her intellectual and moral powe[illegible] elevation.

By the passing of the Act of [illegible] the Independents, along with oth[illegible] were subjected to much suffering, [illegible] an express assent and consent [illegible] tained in the revised Prayer-bo[illegible] was to cause 1900 or 2000 of the [illegible] church. Still the Independents [illegible] Revolution of 1688, and the passin[illegible] tion Act in 1689, at length broug[illegible] Efforts were made about this time to [illegible] an accommodation between them and the En[illegible] Presbyterians; and in 1691 heads of agreem[illegible] were drawn up, but with little practical res[illegible] In 1730 Presbyterians, Baptists, and Independen[illegible] formed themselves into a united body, under the name of the Three Denominations, for the protection of their civil and religious liberties. The Independents are the largest dissenting body in England except the Wesleyan Methodists. The largest confederation of its churches is 'the Congregational Union of England and Wales,' which is careful to lay down in its basis the principle that 'it shall not, in any case, assume legislative authority, or become a court of appeal.'

An Independent church is, from its very constitution, at liberty to choose any man for its minister whom it considers qualified for the office

—subject only to the check arising from the fact that neighbouring ministers will refuse to ordain or recognise a man whom they have reason to regard as disqualified. But from the beginning the Independents have attached great importance to an educated ministry. Their leaders in the Puritan age, such as Owen, Howe, and Greenhill, were men of great learning, and, as soon as the Act of Toleration in 1689 allowed, measures were taken for securing a succession of educated men.

In 1890 the *Congregational Year-book* reported 4817 churches and preaching stations in the United Kingdom connected with the body, of which 101 were in Scotland, 29 in Ireland, with 91 stations, and in the Channel Islands 11. In Canada there are 184 churches and stations, in Australia 300, in New Zealand 25, in South Africa 41, in Jamaica 41, in British Guiana 38, in India 31, in China 2, on the continent of Europe 4—making a total of 666. There are in all 18 colleges for training ministers, with 62 professors and 472 students; besides 10 institutes in heathen lands belonging to the London Missionary Society (which is chiefly maintained by Independents), training about 300 native students.

The colleges in Great Britain include 'New College,' London, a union of three older colleges—Homerton, Highbury, and Coward; Hackney College, London; Lancashire College, Manchester; Yorkshire College, Bradford—a union of Airedale and Rotherham colleges effected in 1888; Mansfield College, Oxford, formed by the transference in 1886 of Springhill College and its revenues from Birmingham to Oxford, where graduates of any British university are eligible as students, pursuing part of their studies in the theological classes provided by other colleges of the university; Cheshunt College, belonging to Lady Huntingdon's trustees,
ed for the preparation of young men for the
n ministry in any section of the church to
y might be called, but virtually an Inde-
lege; Western College, Plymouth, the
e colleges, dating from 1750; Notting-
tal Institutes for the training of
illage pastors; in Wales, Brecon,
r; 'Carmarthen Presbyterian
by Dr Williams' trustees, who
an Independent theological
dependent students; and the
the Scottish Congregational
.

ndency may be traced back
ommonwealth, during which
he chaplains and soldiers of
present Independent churches
ir origin mainly to a mission-
end of the 18th century, chief
of which were the brothers
aldane, Greville Ewing, John
n Aikman. The Haldanes
course of time—a circumstance
y divided and weakened the new com-
he formation of an academy for the
of ministers in 1811. and of the Congrega-
Union about the same time, did much to
the lost vigour of the body. It should
ded that the Baptist churches, both in Eng-
d and Scotland, are as strictly 'Independent'
as those which bear that name.

In America the first Independent church was founded at Plymouth, New England, in 1620 by a party of pilgrims sent from Holland by John Robinson. In 1637 the spread of Antinomian doctrine caused much discussion in the church. By a synod convened in New England Antinomianism (q.v.) was unanimously condemned. In 1638 Harvard College was founded. In 1658 the Savoy Confession was adopted. It still remains in force. Unitarian principles spread about 1750 widely in the Congregational churches of America. In 1785 a separation took place between the Unitarians and the Trinitarians, but both still retain the Congregational form of church government. In 1883 the Unitarian churches of this order numbered 360. There is a Unitarian theological seminary at Meadville, Pennsylvania, and Harvard (q.v.) has only of late years been professedly non-sectarian. 'Congregationalism,' according to Dr Schaff, 'is the ruling sect of the six north-eastern states, and has exerted, and still exerts, a beneficial influence upon the religious, social, and political life of the whole nation.' American Congregationalism is somewhat nearer to Presbyterianism than the English type. In addition to the Conference, or Association of Churches, by which they co-operate for common ends, a national council meets triennially 'for advisory and not juridical ends;' but this council is the recognised agency for deciding as to ministerial or ecclesiastical fellowship. In 1889 the number of Congregational churches in the United States was about 4569, with 475,608 church members, and nearly 580,672 children in Sunday-schools. Besides such well-known colleges as Bowdoin, Amherst, Williams, and Oberlin, the American Independents possess theological seminaries at Andover, Bangor, New Haven, Hartford, Oakland, Chicago, and elsewhere.

See Vaughan's *History of English Nonconformity*; J. Fletcher's *History of Independency*; Waddington's *Congregational History, 1200 to 1850*; Hanbury's *Memorials*; Neal's *History of the Puritans*; Dr Stoughton's *Ecclesiastical History of England*; Skeats's *History of the Free Churches of England*; and Barclay's *Inner Life of the Religious Societies of the Commonwealth*. For the scriptural and apostolic basis of the system, Independents refer to Whately's *Kingdom of Christ* and Hatch's *Bampton Lectures* (1880). See also the article PURITANS.

**Index** (in full, INDEX LIBRORUM PROHIBITORUM or EXPURGANDORUM), a catalogue published by papal authority in the Roman Catholic Church of books the reading of which is prohibited to members of that church, whether on doctrinal, moral, or religious grounds. As a natural consequence of the claim of the Catholic Church to authority in matters of religion, and to infallibility, that church also claims the right or the duty of watching over the faith of its members, and of guarding it against every danger of corruption, the chief among which is held to be the circulation of books believed to be injurious to faith or to morality. The earliest recorded exercise of this restrictive authority is the prohibition of the writings of Arius. The earliest example of a prohibitory catalogue is found in the decree of a council held at Rome (494) under Pope Gelasius, which, having enumerated the canonical books of Scripture and other approved works, recites also the apocryphal books, together with a long list of heretical authors, whose writings it prohibits. The medieval popes and councils pursued the same course as to the heterodox or dangerous writings of their respective periods; and the multiplication of such books after the invention of printing led to a more stringent as well as more systematic procedure. The university press of Louvain issued in 1546, and again in 1550, a catalogue of prohibited books. Similar lists appeared by authority at Venice, Paris, and Cologne; and Pius IV. issued in 1557 and 1559 what may be regarded as properly the first Roman Index. One of the gravest undertakings of the Council of Trent was a more complete and authoritative enumeration of all those books the use of which it was expedient to prohibit to the faithful. A committee was appointed for the purpose. But it was found impossible to bring the examination of the books to an end before the close of the council; and the entire papers of the committee were handed over by the council to the pope, with instructions that the work should be completed, and the result published by his own authority, which was accordingly done by Pius IV. in 1564. Further additions and certain modifications of its rules were made by Sixtus V. and Clement VII. It was republished in 1595, and, with the addition of such books as from time to time it was deemed expedient to prohibit, in several subsequent editions, the most remarkable of which are those of Brasichelli (Rome, 1607); Quiroga (Salamanca, 1601); and Sotomayor, *Novissimus Index* (Madrid, 1648). The edition best known to modern theological readers is that of Rome (1819).

The prohibitions of the Roman Index are of two classes, either absolute and total or partial and provisional, 'until the book shall have been corrected.' The ground of the prohibition may be either the authorship of the work, or its subject, or both together. Under the first head are prohibited all the writings of *heresiarchs*—i.e. the first founders of heresies—no matter what may be the subject. Under the second head are prohibited all books confessedly immoral, and all books on magic, necromancy, &c. Under the third are prohibited all books of heretical authorship treating on doctrinal subjects; all versions of the Bible by heretical authors; and all books, no matter by whom written, which contain statements, doctrines, or insinuations prejudicial to the Catholic religion. The preparation of the Index, in the first instance, was committed to the care of the Congregation of the Inquisition in Rome; but a special Congregation of the Index was established by Pius V., and more fully organised by Sixtus V. This congregation consists of a prefect (who is always a cardinal), of cardinals, of consulters, and of examiners of books (*qualificatores*). Its proceedings are governed by rules which have been authoritatively laid down by several popes, especially by Benedict XIV., in a constitution issued July 10, 1753. The growth of modern literature has, of course, entirely outstripped the limited and tardy machinery of this tribunal. A very small proportion even of the most anti-Catholic publications outside of Italy appear even by name in the Roman Index; but, besides the positive prohibitions of the Index itself, there are certain general rules regarding the use of books by which the freedom of what is considered perilous or pernicious reading is much limited among members of the Roman Catholic Church.

Few parts of the Roman Catholic system are more repugnant to Protestants than the institution of the 'Index Expurgatorius,' as striking at the root of the fundamental principle of Protestantism itself—the liberty of private judgment. In this list may be found the works of Jewel, Barclay, Usher, Sanderson, Bull, and Pearson (but, as has been pointed out, not the most really formidable English attacks on Romanism), the works of Chillingworth and Hooker, not to speak of Milton, Bunyan, and Swift.

**Indexing.** The need of indexing has become more urgent as the mass of materials to be indexed has increased, and the circle of those who wish to use these materials has become wider. Lord Campbell proposed to bring a bill into parliament to deprive an author who published a book without an index of the privilege of copyright. There are two classes of books to be indexed—viz. books of facts and books of opinion. In the indexing of the first class, experience, care, and common sense are needed, and the work must be systematic and not casual. In the second class these qualifications are required and something else—viz. the insight of the precis writer. The indexer must understand his subject and also understand the wants of the reader. The index must be exhaustive in its indication of the various points in the book, and concise in expression, and in addition the indexer must be careful in the choice of catchwords or titles for his headings. He must gather together the same subjects under one heading, and see that they are not separated under synonyms. An author frequently uses periphrases to escape from the repetition of the same fact in the same form; but these periphrases will give little information when inserted as headings in an index, and it is in this power of selecting the best catchword that the good indexer will show his superiority over the commonplace worker. The meaning of the word index has gradually grown from the general to the particular, and the word is now established as denoting a series of references arranged in alphabetical order. There are other kinds of indexes; but these require an explanatory adjective, as classified, chronological, &c. In indexing names it is most important to specify the cause of reference, as a block list of references after a name is almost useless. A colossal instance of this fault will be found in Ayscough's index to the *Gentleman's Magazine*, where all the references under one surname are placed together without even the distinction of the Christian name. There are 2411 entries under Smith, and it has been calculated that to go through this mass in order to find say Zachary Smith would take the consulter eight days of ten hours a day. It is also important to bring all the references to one man under one heading, and not to separate them under the different names or titles he may have borne. In the index to Scott's edition of Swift's Works there are 638 references to Harley, Earl of Oxford, arranged thus: 227 under Robert Harley, 111 under Lord Oxford, and 300 unde[illegible] Treasurer (Lord Oxford). There should be [illegible] index for a complete work and not a sep[illegible] index for each volume. Again, no classif[illegible] should be allowed in an alphabetical inde[illegible] vicious habit of classification makes the [illegible] some well-known papers practically val[illegible] consulter of the index wishes to fin[illegible] volume contains anything on a par[illegible] and he is only confused and anno[illegible] look in a succession of alphabet[illegible] such headings as original artic[illegible] spondence, &c. The preparati[illegible] consists of three divisions: (1) [illegible] arrangement, (3) printing. Each [illegible] out the mode of procedure which [illegible] for himself; but it may be said ge[illegible] cap paper is the most conveni[illegible] Those entries which are not like[illegible] can be written down on the page as [illegible] in the case of large headings it wil[illegible] venient to use a separate page for ea[illegible] these pages in an alphabetised guard book so t[illegible] they can be turned to in a moment. When t[illegible] time comes to cut up the index and arrange it [illegible] alphabetical order, it will be necessary to see tha[illegible] there are no repetitions of the same subjects under various synonyms. Now is the time to make the cross references, and here considerable judgment is required. When the entries are short and few, it is better to repeat them than to refer from one to the other; but in the case of long entries cross references are very advantageous, and it is always well to refer to cognate headings. No reference to the contents of a general heading which is without subdivision should be allowed. If a general heading is divided into sections, and each of them is clearly defined, they should be 'cross-referenced,' but not otherwise. When the arrangement of the cut-up slips is undertaken, some alterations and revision of headings will frequently be found advisable. The value of an index is greatly enhanced by the proper setting out of the entries with judicious use of different types. When a book is a complete treatise on a special subject, a well-made index will form an admirable key to the subject and be in itself intrinsically useful. The above remarks generally apply to indexes of separate books; but indexes may be and are made to a particular subject in which the references relate to several books. The increase of these indexes is much to be desired, as they form admirable helps to knowledge. The Index Society, to form a library of indexes, and to make indexes to important books, rare serials, &c., was founded in December 1877. See the article BIBLIOGRAPHY; and H. B. Wheatley's *How to Catalogue a Library* (1890).

**India,** an extensive region of southern Asia, and next after China the most populous area in the world. It was celebrated during many ages for its riches and natural productions, its beautiful manufactures and costly merchandise, the magnificence of its sovereigns, and the early civilisation of its people. It possesses especial interest to British people from the imperial connection of its history with that of their own nation. It affords, too, the greatest market in the world for British textile manufactures, and a great field for the employment of British capital.

*Nomenclature.*—The name India comes to us, through the Romans, from the Greeks, who borrowed it from the Persians. The latter applied the name Hind to the dwellers in the basin of the Sindhu River, a Sanskrit name for the Indus. Sindhu, by the regular change of *s* into *h*, becomes Hind. The river is still called Sind; while the
d is Hind. Officially, then, the country is Hind
vernacular, and India in English. The
l name Hindu is derived from Hind. Then
ndu came the name Hindustan, which is
vince—viz. the region of the Jumna and
es. This name has sometimes been
ndia as a whole, but this is quite

rite of Further India and Hither
er, lying eastward beyond the
s mostly in native hands, and
h protection. The latter is
inion, and is in legal phrase
1877 proclaimed as the Indian
e will refer only to the official
. It will for method and con-
d into five parts—I. The Land;
I. The Government and the
V. The Civil Administration;

. THE LAND.

entral peninsula of southern Asia,
4′—35° N. lat. and 67°—92° E.
ng to these limits, its length may be
imately at 1900 miles, and its breadth,
d along the parallel of 25° N. lat., at 1600
with an area of at least 1,350,000 sq. m.
round numbers the square miles contained
is area may be reckoned at one million and a half—inclusive of Burma. The natural boundaries of this vast region are, on the N., the range of the Himalaya Mountains, which separates it from Tartary, China, and Tibet; on the W. the Suliman Mountains, dividing it from Afghanistan and Beluchistan; on the SW. and S. the Arabian Sea and the Indian Ocean; on the E. the hill-ranges which border upon Burma, and the Bay of Bengal. From the mouths of the Brahmaputra on the eastern side, and of the Indus on the western side, the two coasts, east and west, incline towards the same point, and meet at Cape Comorin, thus producing the form of an inverted triangle. The two sides of the triangle have together a coast-line of about 2000 miles. Thus southern and central, or as it may be called peninsular India, is from its extent of seaboard a maritime country. It is northern India only that has a continental character.

*Geography.*—For the geography of India there exist excellent materials from the *Grand Trigonometrical Survey*—a work of the highest scientific value—which has determined the height of the mountains and the situation of all the principal places; from the topographical survey, which has displayed the contour and configuration of the whole country; from the revenue and cadastral surveys, which have delineated the boundaries not only of villages but of fields also for all provinces except Bengal and Behar. The region presents a diversified surface and scenery. It has indeed been called 'an epitome of the whole earth,' consisting as it does of mountains far above the level of perpetual snow, broad and fertile plains, bathed in intense sunshine, arid wastes, and impenetrable forests. Its natural divisions are the Himalaya, the sub-Himalayan ranges, the plains of the Ganges and the Brahmaputra, the basin of the Indus, the highlands of Hindustan, the Vindhya and Satpura ranges, and the peninsula south of those ranges.

The Himalaya (meaning 'the abode of snow') consists of a chain some 1500 miles in length, in which the links are formed by mountain knots covered with perpetual snow, some of which rise from 20,000 to near 30,000 feet above sea-level, and are the highest yet discovered in the world. It is the dominating factor in the geography of northern India, being the source of the Indus, the Ganges, the Brahmaputra, and of their principal affluents. See HIMALAYA.

The sub-Himalayan ranges run between the chain of the Himalaya and the plains of the Ganges and Indus. They occupy Cashmere, the Simla hill-states, Gurhwal, Kumaon, Nepál, Sikkim, and Bhutan, which, owing to their elevation above the sea (5000 to 9000 feet), have a climate like central Europe in summer and cold as Switzerland in winter, with the vegetation of the temperate zones. These regions are separated from the plain of the Ganges by the submontane tract called Terai, which extends in a long belt, 5 to 25 miles in width, from Hurdwar (where the Ganges issues from the sub-Himalayan ranges) to the Brahmaputra. It is covered with forest, and is the haunt of wild beasts. The soil is very fertile, but malaria has rendered it uninhabitable by man and the domestic animals, at least from April to October. This wilderness is being gradually narrowed or invaded by the progress of drainage and cultivation.

The plains of the Ganges and the Brahmaputra, which include Bengal, Behar, the Doab (meaning the 'Mesopotamia' of the Ganges and Jumna rivers), Oudh, and Rohilcund, form an alluvial flat, terminating in a delta, and extending from the Bay of Bengal to the slight uplands on the Punjab border that form the water-parting between the Ganges and the Indus. Throughout its entire length the Ganges and its numerous tributaries spread out like the veins of a leaf, carrying everywhere their fertilising influence. The population of these fertile and well-cultivated plains is very dense.

The basin of the Indus, in the north-west, is towards the south separated from that of the Ganges by the Aravalli Hills. The Punjab occupies the northern portion. South of the Punjab, and parallel with the river, the great sandy desert of the Indus extends for nearly 500 miles. The valley of the Indus is continued through Sind to the

Arabian Sea. Between the Indus region and the Aravalli Hills lies the Thur desert, an expanse covered with sandhills, 400 miles long and 100 broad. It is only in the neighbourhood of the Indus and some of its tributaries that the surface can be cultivated by means of river-irrigation—although crops of grain may be grown in hollows and narrow valleys after the rains. The horse and camel alone can cross this desert, which is described in Hindu geography as 'the region of death.'

The highlands of Hindustan extend from the Vindhya and Satpura mountains as a base to the border of the Thur desert. They include the tableland of Malwa and Rajputana or Rajasthan, which has an elevation of about 2000 feet above the level of the sea.

The Vindhya and Satpura ranges are two hill-chains, with an elevation from 2500 to 4000 feet, partly though not entirely parallel from east to west, and divided from each other by the valley of the Nerbudda River. They form what may be called the backbone of middle India, or, by another metaphor, a broad wall dividing northern from southern India.

The peninsula south of the Satpura range is in two divisions. The first is the Deccan (q.v.), which name means 'the south.' This area is a central tableland extending from 12° to 21 N. lat., rising from 1500 to 2000 feet above the sea, and enclosed on all sides by mountain-ranges. These ranges are the Satpuras above mentioned, the Eastern Ghâts, somewhat low, facing the Bay of Bengal, and the Western Ghâts, higher and more important, facing the Indian Ocean. Between the Eastern Ghâts and the sea are fertile littoral tracts known to history as the Northern Circars and the Carnatic. Between the Western Ghâts and sea is a similar tract known geographically as the Konkan. As a northern continuation of this tract is Gujarat, with its offshoots the peninsulas of Kathiawar and Cutch. From the low land of the Konkan to the Deccan plateau the mountains rise in a succession of geological formations looking like gigantic terraces. The rivers of the Deccan rise in the Western Ghâts, and, after traversing the tableland, descend to the sea by passages through the Eastern Ghâts. The slope of the country corresponds with the course of the rivers; it has a gradual inclination towards the east. The second division begins technically from the Tungabhadra River, but geographically from the hills south of Cuddapah. It extends right down to Cape Comorin, the apex of the inverted triangle, and includes Madras, Tanjore, Trichinopoli, Tinnevelli, and other famous places.

To this summary of natural divisions a brief notice of the mountains and rivers may be added.

The *mountain-system* forms a connected whole. It is separate from the Himalaya and from the Suliman range, which forms a wall between India and Afghanistan. It may best be followed from the southern point, Cape Comorin, northwards, thus: From that point there run upwards two long lines of hills and mountains, one north-easterly, the other north-westerly. The north-easterly line comprises the Eastern Ghâts already mentioned, which become merged in the hilly region on the west of Bengal, and runs up to the neighbourhood of Allahabad, at the junction of the Jumna and the Ganges. This line nowhere exceeds an altitude of 3500 feet above sea-level. The north-westerly line comprises the Travancore and Palni hills, the Nilgiri, the Western Ghâts, the Aravallis, and the Rajasthan hills, up to the neighbourhood of Delhi. This line has at several places considerable altitude, for example in the Nilgiri ('Blue Peak'), 8000 feet and upward; and Mahabaleshwar (near Poona) and Abu in Rajputana, upwards of 4000 feet. These two lines are as the sides of a triangle, and are joined at the top by the two transverse and parallel ranges of the Vindhya and Satpura already mentioned. Thus the mountain-system, like the external configuration of the country, is in the shape of an inverted triangle.

The *river-system* may be thus epitomised. The Indus in the north-west, with a course of 900 miles after issuing from the Himalayas, drains with its four famous affluents, the Sutlej, the Ravi, the Chenab, and the Jhelum, about 300,000 sq. m., and empties itself into the Arabian Sea. In the north-east the Ganges, with the Jumna and other affluents, and the Brahmaputra and Meghna—all which join in the Bengal delta—drain about 500,000 sq. m. Owing to their virtual amalgamation in Bengal, it is difficult to assign a length to the courses of these rivers, which empty themselves in the Bay of Bengal. The central region—viz. that of the Vindhyas and the Satpura—about 100,000 sq. m.—is drained by the Nerbudda and the Tapti, the former having a course of 800 miles, the latter of 400 miles, and both flowing west into the Gulf of Cambay, a branch of the Arabian Sea. The remaining area (viz. 600,000 sq. m., out of a total of 1,500,000) consists of the Deccan and the peninsula. It is drained by the following rivers: Mahanadi, with a course of 520 miles; Godavari, 898; Kistna, 800; Tungabhadra, 400; Pennar, 350; and Kaveri, 470. There are many other rivers which cannot be particularised here. Among them may be mentioned the Hooghly and the Gumti, Calcutta being situated on the former and Lucknow on the latter; both belong to the Gangetic system.

*Geology.*—In 1856 a staff of geologists commenced a geological survey of India, which has since then been steadily continued. They have examined an area several times as large as that of Great Bri[illegible] and supplied for the districts with which [illegible] have dealt an accurate knowledge of the [illegible] resources.

Professor Medlicott summarises the [illegible] result thus. 'Geologically India is [illegible] three distinct areas: (1) peninsular [illegible] peninsular, separated by (3) t[illegible] plains, formed of the deposits of [illegible] and their tributaries. (1) is [illegible] immense antiquity, all the [illegible] within it being of aerial or fluvi[illegible] the newest of them of Lower [illegible] principally a *massif* of gneissic [illegible] and basins of transition strata [illegible] culminating in the Vindhyan [illegible] unaltered and undisturbed st[illegible] determined age, being unfossil[illegible] separate from the Vindhyans com[illegible] formation: near its base the Indi[illegible] on Upper Palæozoic, while the top [illegible] near the coasts, contains Upper Ju[illegible] fossils. A great volcanic formation, know[illegible] Deccan Trap, covers an immense area in Bomb[illegible] and Central India; the deposits locally found in [illegible] contain only fresh-water fossils; in Gujarat [illegible] occurs between Eocene and Cretaceous marine strata. Along the outer margin of the plains (2) presents an almost unbroken face of Tertiary rocks, of immense thickness, and more or less intensely disturbed. On the west, associated with Cretaceous strata, they extend to form the uplands of Afghanistan and Persia. On the east, again associated with Upper Secondary beds, they abut against the crystalline rocks of the Malayan axis. On the north they form the sub-Himalayan chain at the base of the central Asian *massif*, the southern ridges of which form the Himalayas; in this position the Tertiary series, except at its very base, is inclusively of fluviatile formation, like the plains, and contains the famous Siwalik mammalian fauna. The outer Himalayan is formed of crystalline and other rocks of uncertain age; but on the north side of the range there is a full succession of Palæozoic and Secondary marine formations. At the north-east angle of the plains the Shillong plateau of crystalline rocks, capped by horizontal Tertiary strata, separating the lower Assam valley from Sylhet in eastern Bengal, is an outlier of the peninsular *massif*. At the north-west angle of the plains, in the Salt Range of the Punjab, there is again a small exposure of the ancient limit of the peninsular massif, presenting an outcrop of coastal deposits of Palæozoic age. Besides the Gondwana coal, a light coal occurs sporadically in the Tertiary rocks from Sind to Cashmere, and in upper Assam there are rich coal-measures of about the same age; in both these regions, also, petroleum is more or less abundant. Pure iron ores are abundant throughout the peninsula and in the outer Himalaya; other ores are comparatively scarce, except along the Malayan axis. The diamonds of India and the aluminous gems of Burma are well known.'

In ancient times there were gold-mines in the mountains of the south-western regions, which supplied the metal for the gold coinage which was then almost universal in the country. The most accessible parts of the auriferous strata have been worked out ages ago, and the remnant forms what is known as the Mysore mines. There are other auriferous deposits in parts of the Deccan. Silver has never been discovered in any appreciable quantity within the country; but in the middle ages it was introduced largely from across the
Himalayas and used for coinage. In the Shan de-
dencies of Burma, however, it is extracted from
e. Coal is obtained largely in western
n the Satpura Hills to a considerable ex-
in the Deccan to some extent, and in some
s also—enough, on the whole, to supply
s. Iron and copper are found and
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ineral products of lesser import-
still found in the central hills,
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from the foregoing summary
ntry extending over 26° of
ty of which runs far into the
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above the line of perpetual
racing lowland plains, elevated
regions, that the climate must
The whole country has three
s—the cool, the hot, and the
cteristic applies without distinc-
rts of the country; even to the Hima-
have otherwise a climate like that of
The cool months are November, De-
nuary, and a part of February; the dry
er precedes, and the moist hot weather
he periodical rains. The rainy season falls
middle of summer; its beginning is earlier or
ccording to circumstances, its ending is in
ember. But in Burma it lasts longer; and in
peninsula there is a second rainy season,
the latter rains, during the autumn. The
r is the pleasant period; the spring is gener-
ot and healthy; the summer depends on
uration of the rains; the autumn is close, malarious, and unhealthy. The rainy season everywhere comes from the same cause—viz. the attraction by the sun of moisture from the ocean in clouds, and their condensation into rain upon the land. It is called monsoon, probably a corruption of the Persian word for season (see MONSOON). It is the occasional failure of the monsoons that causes the periodical famines to which the country is liable. The central table-land is cool comparatively, but the alternations of heat and cold differ greatly elsewhere. In the north-west there is burning heat with hot winds in summer, and frost at night in winter. In the south the heat is more tempered, but the winter is cool only, and not cold. At Ootacamund, on the Nilgiris, 7200 feet above the level of the sea, the mean annual temperature is 58° F.; at Madras, 83°; Bombay, 84°; Calcutta, 79°; Bangalore, 74°; and at Delhi, 72°. But at places like Delhi, where the heat of summer is tremendous, the average is reduced by the cold in winter. The fall of rain varies greatly in different parts of the country. In the north-eastern and other outlying parts it exceeds 75 inches; at one observatory in north-east Bengal, Cherra Punji, there is a phenomenal fall of 600 inches in the year. In the Deccan, in the upper basins of the Ganges and the Indus, it is 30, and in the lower regions of the Indus less than 15 inches. The remainder of India is placed between the extremes represented by these damp and dry belts, but is, as compared with Europe, an arid country. Hence the necessity of tanks and irrigation canals to supply moisture to the soil, and to obviate the danger of drought and famine. A meteorological department has been established, with 164 observatories, the chief of which are at Calcutta and Bombay. See Henry F. Blanford's *Practical Guide to the Climates and Weather of India* (1889).

*Fauna.*—The domesticated animals are, first, the cattle—cows, buffaloes, oxen; the last two do the work of agriculture. The bull and cow are sacred animals to Hindus, and by them are never killed for food. The indigenous breeds of horses in India are being improved by the importation of foreign sires. They have never been employed in agriculture. The pony, the donkey, and the mule are largely used. Sheep and goats are abundant. The pig is plentiful, but is despised by the upper and middle classes of the people. The monkeys are tame and are held sacred. The wild animals include the tiger, panther, cheetah, boar, bear, bison, elephant, and rhinoceros. The crocodile and alligator infest most of the rivers. Deer of all sorts abound everywhere, and mainly supply sustenance to the carnivorous animals. The lion, the hyæna, the lynx, and the wolf are unimportant. The elephant is used only for purposes of war or of state, both by the government and by the native nobility. The ibex and the ovis-ammon (the wild goat and the wild sheep) are found only in the highest parts of the Himalayas. Poisonous snakes abound, the worst being the cobra da capello (the black-hooded): many thousands of the natives die from snake-bite in the year. The government offer rewards, and many thousands of animals, including snakes, are destroyed. The area supporting these animals has shrunk during the present century from the spread of cultivation, and is still shrinking. Destructive visitations of locusts happen occasionally. The birds are, of course, infinitely various; but several of the most beautiful or remarkable species are wanting. The eagle is found only in the Himalayas, so is the pheasant. The partridge is seen in all the plains, and in some places the quail is abundant. The snipe is found in the marshy land; waterfowl swarm in some localities, and flights of wild geese sweep through the air. Vultures and other birds serve as scavengers. The crow is common everywhere, but not the raven.

At the seaport towns the supply of fish for

European consumption is excellent, and fish-curing is largely practised by the natives. Inland the fishing in the mountain-streams is good, but in the rivers of the champaign the fish, though abundant in quantity, are not esteemed for quality. See W. T. Blanford's *Fauna of British India* (1888 *et seq.*).

*Flora.*—Nearly half of the country is tropical, though none of it is equatorial, and a part is not only temperate, but cold; accordingly the vegetation varies greatly. As compared with equatorial regions, the country has tropical products plentiful and good, but not first-rate, such as tobacco, sugar, ginger, and spices of all sorts. Rice has from time immemorial been a staple. Maize and millet are articles of food for the stronger races. Oilseeds are largely exported. The cultivation of wheat has greatly developed for exportation since the era of cheap prices. Tea is grown largely under European supervision in the Eastern Himalayas, and already surpasses the China teas. Coffee is grown in the south, but with chequered success. Among the dyes, indigo and lac (red) are noteworthy. European flowers of all sorts are cultivated nowadays. The indigenous flowers are not rich, the water-lilies being the best; the flowering shrubs are very fine, however. Of trees in the plains near the coasts the palm order with its several varieties strikes the observer. Inland the mango fruit-tree and the orange, the umbrageous banyan, the sacred peepul, and the bamboo are features in the landscape. In the hills the teak and other useful timber trees are obtained. In the Himalayas are the cedar, the pine, the fir, the juniper.

The primeval forests which covered the country have long been restricted to the hill and mountain system already described. But further, in this country, as in many other countries, the hills have been deforested by reckless destruction during many generations, to the injury of the climate and of that water-supply on which so much depends. Conservation of forests was not attempted under native rule, nor under British rule until the middle of the 19th century. Since that time, however, a forestry department has been set up as a branch of the administration in every province, with European officers trained in Europe. For the whole country, the forests under supervision amount to 100,000 sq. m., of which two-thirds are under complete conservancy. Besides augmenting the national resources, the forestry is profitable, and yields a net revenue yearly of more than half a million sterling.

The agricultural statistics show that barely one-third of the whole country is cultivated or grazed. Of the remainder a portion is available for cultivation; the rest is uncultivable, consisting of stiff hillsides, desert, river-beds, &c.

## II. The People.

*Population.*—This has since the middle of the 19th century been ascertained by census. The decennial census of 1881 showed 253 millions of souls for the whole country, including the British territories and the native states, and an increase of 13 millions over the preceding census—apparently a growth of 1⅓ million annually. This total was exclusive of the population of the Cashmere state, which really belonged to the country, and of Upper Burma, subsequently annexed. These added bring the total to 269 millions and upwards; and even this total is exclusive of Nepál. In round numbers, then, the population may be stated at 270 millions, which makes this dominion the most populous in the world, next after China. But though populous the country is not as a whole densely peopled; the average of inhabitants to the square mile being 228 for the British provinces, 108 for the native states, and 184 for the whole country. The hill and mountain system, indeed, shows a sparse population; but the plains of the Ganges and the Brahmaputra, again, and the coast districts and the southern peninsula, are densely peopled. The Gangetic plain generally has an average of 400 to the sq. m.; and some parts of it, near Benares and Patna, show an average actually double the above, and a density which is quite excessive. Of the 253 millions not more than 25 were urban, the rest being rural. Thus the vast majority of the people live in the country, and most of these are agricultural or pastoral. Everywhere the returns show an excess in the number of males over that of females.

The population of the three presidency cities are: Calcutta, 447,601; Bombay, 644,405; Madras, 397,552. Below these there are thirteen towns with more than 100,000 inhabitants each, and below these again twenty-eight with more than 50,000 each.

*Ethnology and Language.*—The languages of the present day as well as those spoken in former ages, as far as these are known to us, belong to four different stocks—viz. the Aryan, Dravidian, Kolarian, and Tibeto-Burman stocks. In point of chronological order the Kolarians appear to have been the first settlers, and all indications point to their having originally entered India from the north-east, and having thence spread westwards over the northern plains. As regards the tribes speaking Tibeto-Burman dialects, they are confined to the skirts of the Himalayan range; thus forming, as it were, the southern edge of the wide Tibetan speech-field, having probably penetrated at various times, from the plateau of Tibet, through the numerous passes of the Himalayas. Eastwards, again, these dialects stretch, in a more or less continuous chain, until they merge in the compact body of Burman speech [illegible] whilst a separate linguistic development [illegible] it necessary to treat the Kolarian and Ti[illegible] man languages as two distinct groups [illegible] highly probable that they were ultimat[illegible] from the same Mongol stock. Af[illegible] Kolarian settlers would seem to [illegible] turbed in their possession of [illegible] by the inroads of Dravidian tr[illegible] gained entrance into India [illegible] western passes, seem to ha[illegible] driving the Kolarians into [illegible] tricts which border the Gange[illegible] and ultimately to have force[illegible] them, and poured themselves [illegible] into the southern peninsula. [illegible] they were already urged onward [illegible] race following in their wake [illegible] certain it is, however, that at [illegible] subsequent to the immigration [illegible] probably more than 4000 years [illegible] Aryan stock must have entered the [illegible] rivers' (Punjab) either through those [illegible] of the Suliman range, the command of wh[illegible] so often decided the fate of India, or by [illegible] northerly and yet more rugged route, ac[illegible] Hindu-Kush, and by way of the Pamir plat[illegible] the highland valley of Cashmere. In favour [illegible] latter alternative it has been urged that ther[illegible] to this day settled, to the north of Cashmere [illegible] Kabul, several tribes of the Aryan stock, such [illegible] the Dards and the Siah-Posh Kafirs, whose vernacular dialects are of so archaic a character as to have suggested the idea that these tribes may perhaps be the direct descendants of some remnants of the primitive (Indo-Iranic) Aryans which had remained behind in the old homes when the great body of their brethren took their departure in quest of more favoured abodes. However, our knowledge of these waifs and strays of the Aryan stock is still very imperfect; and they may after all turn out to be mere detached dialects of either the Indic or the Iranic branch of Aryan speech. Between these two divisions no sharp line of demarcation can indeed be drawn; but the languages of the countries west of the Indus—viz. the Pushtu (or Pakhtu) of the Afghans, and the Baluchí, one of the two principal languages of Beluchistan—form intermediate links, being by most scholars included in the Iranian group, whilst others would rather refer them to the Indian division.

(1) *Indo-Aryan Group.*—The earliest accessible form of Aryan speech in India is the *Vedic*, especially the language of the sacred hymns of the Rigveda which represent the Aryan tribes as settled in the Punjab. Even at that early period dialectic varieties seem already to have existed to some extent among different tribes. In the course of the later Vedic ages the Aryan language extended its sway eastward over nearly the whole of northern India. During this process foreign ethnic elements were doubtless largely absorbed by the Aryan community, and the greater or less proportion of such admixtures, coupled with independent political formations, could not fail ere long to produce different dialects of marked individuality. Meanwhile, the exegesis of the sacred hymns, already largely unintelligible at the time when they were first collected, and the consequent close cultivation of grammatical and phonetic studies, resulted in the grammatical fixation of the literary language (hence called *Sanskrit*—i.e. 'completely or correctly formed, polished'), probably about the 6th century B.C. Henceforth the divorce between the literary idiom and the popular dialects was complete. The existence of such ialects at that time is amply attested by the [illegible] at *Gautama S'ákyamuni (or Buddha,* 'the ed,' as he subsequently called himself), in his new gospel of salvation through indi- iteousness, made use of the Mágadhí, [illegible] called *Páli*, the local dialect of his [illegible] (Behar), which accordingly became [illegible] ge of Buddhist literature; but [illegible] rammatically fixed idiom, like [illegible] ame gradually estranged from [illegible] which it had originally been [illegible] onical books of the Buddhists [illegible] ouncil held in the reign of the [illegible] ut 250 B.C., but they were not [illegible] g till about 80 B.C., so that [illegible] language is attested for that [illegible] he same Emperor As'oka has, [illegible] thentic dialectic documents of [illegible] the famous rock inscriptions, [illegible] edicts, and scattered over the [illegible] ndia from the vicinity of [illegible] h-west frontier, and Girnar [illegible] on the eastern coast. Simi- [illegible] ne Páli, another local dialect, [illegible] or language of the province of [illegible] present Mahratta country), [illegible] ligious dialect of another large sect, which seems to go back to about the [illegible] as the origin of Buddhism. Moreover, [illegible] opular dialects were early employed for purposes by Indian dramatists. While the Sanskrit in dramatic literature is confined [illegible] characters of the higher classes, women [illegible] ferior male characters are invariably made [illegible] eak various local dialects. These dialects, [illegible] d *Prákrits*—i.e. either 'vulgar' or 'derived rom the Sanskrit')—may be looked upon as the rerunners of the modern vernaculars of northern ndia. Though the oldest existing plays can hardly be placed earlier than the 6th century of our era, the actual use of the Prákrits, as popularly spoken dialects, may go back some centuries before that time. The principal *Neo-Aryan* languages of India are (1) *Bengali*; (2) *Uriyá* (of Orissa); (3) *Hindí* (of the Upper Provinces), with the closely allied *Panjábi* and *Nepáli* (the language of the Goorkhas, the ruling class of Nepál); (4) *Sindhi* (on the lower Indus); (5) *Kashmiri*; (6) *Maráthi*; (7) *Gujaráti*—which Beames (*Comparative Grammar of the Modern Aryan Languages of India*), however, takes to be a mere dialect of Hindí. To these may be added (8) *Assamese*, formerly considered a dialect of Bengali; (9) *Bráhuí*, one of the two languages spoken in Beluchistan, which at one time was thought to be Dravidian, whilst some scholars would even now refer it to the Kolarian group; and (10) *Sinhalese*, the language of the southern half (perhaps at one time of the whole) of the island of Ceylon, doubtless imported from northern India, in the early centuries B.C., by Buddhist immigrants; with its literary dialect called Elu, and the dialect of the Aryanised aboriginal Veddahs.

Many of these languages show a considerable number of dialectic varieties, especially the Hindí, by far the most important of all, of which as many as fifty-nine dialects are enumerated by Cust (*Modern Languages of the East Indies*). Not a few of these dialects are, however, of a very mixed character, owing to their being spoken by Aryanised tribes of one of the three other groups, and consequently showing a more or less strong non-Aryan element. A peculiar and important form (for it can scarcely be called a distinct dialect) of Hindí is *Urdú* or *Hindustání*, which, being Hindí, with a more or less considerable admixture of Persian (and Arabic) words, and written in the Persian character, originated, after the Mohammedan conquest, through the official intercourse of the Persian-speaking rulers and their Hindu subjects—much as in English the original Teutonic groundwork has been overlaid by a thick layer of Romance and Latin vocables and formative elements—and has developed into a kind of *lingua franca* for the whole of India; a southern variety of it being called *Dakhani* or *Dekhni*. In point of the antiquity of its literary documents, Sinhalese stands pre-eminent among Neo-Aryan languages; its development from, or by the side of, Páli being well authenticated by Elu works going back to the 5th century of our era, and by inscriptions of very early date. Next to it comes Hindi, commencing, about 1200 A.D., with the Prithiráj Rásau, a heroic poem by Chand Bardái, composed in an archaic form of Hindí which Trumpp proposes to call 'Old Hinduí;' whilst the term 'Hinduí' is applied by him to a somewhat more modern form, represented by the writings of the religious reformer Kabír (*c.* 1450 A.D.), the sacred books of the Sikhs (the Granth), and Tulsí Dás's translation of the Sanskrit epic Rámáyana. In Maráthi the oldest existing work, a paraphrase of the Sanskrit philosophical poem Bhagavadgítá, claims to have been written in 1290 A.D.; whilst Bengalí literature commences with the religious writings of the Vaishnava reformer Chaitanya, a contemporary of Luther. None of the other languages possess any literature above two or three centuries old.

(2) *Dravidian Group.*—The extension of the Brahmanical civilisation and literature has introduced into these languages, as into those of the other stocks, a very considerable element of Sanskritic words; whilst their grammatical structure has, on the whole, remained intact. As regards the ultimate affinities of this stock, Dr Caldwell, in his *Comparative Grammar of the Dravidian Languages*, has shown that Dravidian speech, in its formative features, betrays a 'family likeness' to the Scythic (Finnic-Tataric) stock; whilst he

also detects in it certain analogies, though of a rather indefinite and remote character, to Aryan speech. The people speaking Drávida languages occupy a compact area extending over the whole of the southern part of the peninsula, with one or two *enclaves* in the Aryan territory. Dravidian scholars recognise twelve distinct languages, only four of which, also the most important in regard to population, have developed anything worthy of the name of a literature—viz. (1) *Tamil*, occupying the south-eastern; (2) *Telugu*, the north-western; (3) *Kanarese* (or *Kannada*, i.e. Karnátaka), the north-eastern; and (4) *Malayálam*, the south-western portion of the Dravidian area. The remaining members of the family are (5) *Tulu*, between the two preceding ones, on the Malabar coast; (6) *Kodagu*, the language of Coorg, adjoining the last named, inland; (7) *Tuda* and (8) *Kota*, both spoken by tribes of the Nilgiri hills; (9) *Gond*, in Central India; (10) *Khond* and (11) *Oráon*, west and north-west of Orissa; and (12) *Rájmahál*, or *Máler*, the language of a tribe of the Rájmahál hills in Bengal. Tamil, which has also extended its sway over the northern half of Ceylon, may boast of a rich and varied literature; its oldest works—the Chintámani, an epic poem of 15,000 lines, and the Kural, a collection of ethical stanzas, both of them by Jain poets—probably dating back to the 10th century, if not earlier. In the sister languages, Nannaya's Telugu translation of the epic Mahábhárata and Kes'ava's Kanarese grammar probably belong to the 12th century; whilst Malayálam, originally a mere dialect of Tamil, commences with the heroic poem Rámacharita, of uncertain date, but probably a century or two later than those works.

(3) *Kolarian Group.*—The term, derived from the tribal name of the Kols, was first introduced by Sir G. Campbell. The people speaking these languages, settled chiefly in the jungly and mountainous tracts of the Central Provinces, are computed to number about two million, though many tribes, such as the Bhíls, who have adopted other languages, especially Hindi, ethnologically doubtless belong to this group. Kolarian speech possesses a very complete suffixal system of inflection, its conjugational system being especially developed. Some of the chief points in which it differs from Dravidian speech are that it has a dual number for nouns, and that it lacks a negative form of the verb. Our knowledge of most of these languages is, however, still sadly defective. Brandreth proposes to include nine different languages under this group, to which Cust adds a tenth; but this scheme is so far only provisional. The best-known member of this family is the *Santáli* spoken by a vigorous tribe inhabiting the so-called Santal Parganas (and adjoining districts) along the western frontier of Lower Bengal—of which we have a good grammar by Skrefsrud (1873). The only other language of this group the grammar of which has been at all adequately treated is the *Mundári*, spoken by Mundas, Bhumij, and Larka Kols; whilst of others, which are probably destined to die out before long, we have as yet only scanty vocabularies.

(4) *Tibeto-Burman Group.*—This field has also as yet been very imperfectly surveyed, most of its languages lying either wholly beyond the Indian frontier, or only just projecting into the British territory. They share the general agglutinative character of the only two literary languages of this family, the Tibetan and Burmese, whilst in them the tone of the voice also plays generally an important part in the meaning of words, though not to the same extent as in monosyllabic languages. Brandreth proposes to arrange these border-languages in nineteen different classes, which Cust reduces to a few geographical groups—viz. the Nepál, Sikkim, Assam, Manipúr-Chittagong, and Trans-Himalayan groups—the last-named group consisting of the southern offshoots of the Tibetan branch of Tibeto-Burman speech.

A curious cluster of dialects, which seems to be independent of any of the four groups of Indian speech hitherto mentioned, is found in the Khási hills, in the province of Assam. There is a good *Khási* grammar by Pryse. This language, in which five or six dialects are distinguished, is of the monosyllabic order; but its exact relationship has not yet been determined.

The word Hindu has been used in various senses. In truth it means all those who profess the Hindu or Brahmanic faith, which, however, consists of many sects. This vast community of nearly 200 millions of souls is divided into several Castes (q.v.), high and low. The high castes are mainly Aryan; the lower castes partly Aryan and partly Dravidian or aboriginal. A person must be born into the high castes, and cannot enter them by conversion. If a person, as for instance an aboriginal, be converted, he can enter the lower castes only. The sections of Hindu community thus summarised differ not only in nationality and language in different provinces, but in customs and dress. Their languages are to be counted by scores.

The Mohammedan (or, strictly, Muhammedan) population, on the other hand (about 50 millions), in all parts of India affect the same customs, and generally speak one language—Hindustání or Urdú. It is the one chiefly known to Europeans. It is the vernacular in the towns alone, and those, too, of the north-west only. In these provinces, also, it is the official language. It is, however, hardly known to the Mohammedans of eastern Bengal, who speak Bengalí. Persian and Arabic are [illegible] or less known as classical languages to the M[illegible] medans of India, but are not spoken. T[illegible] guage of the courts of justice is everyw[illegible] language of the province.

The aboriginal hill-tribes have cause[illegible] the Assam frontier at various times, [illegible] on the north-east frontier near [illegible] tribes of the Dravidian race [illegible] tive state socially. Of these [illegible] are the Bhíls and Gonds, wh[illegible] Vindhya and Satpura region[illegible] Kols, who inhabit the East[illegible] Sontals on the hill-country w[illegible] Bhíls were wont to live by [illegible] to burst out of their jungles [illegible] outrages; but in 1825, after [illegible] subduing them had been uns[illegible] the British government, it was [illegible] them into military service, [illegible] The Khonds and Kols, drive[illegible] and mountains of Central India b[illegible] the Aryan race from the north-w[illegible] served the grim religion that prevail[illegible] country before Hinduism was heard of. [illegible] religion may be briefly characterised as [illegible] worship, with efforts to propitiate the ma[illegible] deities by human sacrifice, principally of chi[illegible] Successful efforts have been made by the Bri[illegible] government to suppress these practices. A[illegible] tribe the Gonds are the strongest; they adopted [illegible] parts of both Hindu and Mohammedan culture, founded a rude dynasty, and signalised their rule by works of material improvement. For more than a century past they have relapsed into their pristine condition. It is from among these aboriginal tribes, numbering in all perhaps fifteen millions, that proselytes to Hinduism are obtained.

*National Character.*—To the inhabitants of India, who, although generally a mixed race of Dravidian and Aryan origin, now form many distinct nations, no general statement can apply. The acute but unwarlike inhabitants of the Gangetic delta are quite unlike the less intellectual but sturdier races of the upper basins of the Ganges and the Indus—i.e. the North-western Provinces and the Punjab. These latter again are dissimilar from the high-bred and chivalrous race of Rajasthan or Rajputana, and the hardy though humble Mahratta of the Western Ghâts. Still further varieties are found in the half-warlike and partly refined races of the eastern coast and southern peninsula, mixed up with races of lesser spirit and culture. The races who in this generation are believed to have political aspirations are the Sikhs of the Punjab—the Sikh faith being really an offshoot of Hinduism—the Goorkhas of Nepál, and the Mahrattas of the Western Ghâts; and perhaps some sections of Mohammedans, who might be aided by Arabs immigrating from Arabia. The Brahmans everywhere, to whatever nationality they may belong, or whatever language they may speak, have a homogeneous character, imbued with a lofty pride transmitted through long generations.

The Mohammedans of central Asiatic descent are strict adherents of their faith, and sometimes fanatical. But those who, like the inhabitants of eastern Bengal and of parts of the Punjab, are merely Hindus or aborigines made Mohammedans by conversion, are of course less orthodox. Their religion is a mixture of the doctrines of the Koran with the local idolatry. The Parsees, a mercantile and educated class, seated at Bombay and along the west coast of India, are the descendants of the fugitive fire-worshippers of Persia. See PARSEES.

The national character cannot be portrayed from this congeries of nationalities, yet some character[illegible]ics can be set forth as generally prevalent: for [illegible]per and middle classes, domestic affection, [illegible]ence, tenacious adherence to custom, venera[illegible] awe leading to superstition, love of ex[illegible]ure, an inclination for abstract medita[illegible] acuteness and subtlety, litigiousness, [illegible]bservation; for the humbler classes, [illegible]ce, docility, charitableness to the [illegible], fortitude under disaster, and [illegible]ualities termed principle and [illegible]stern phrase cannot be predi[illegible] Deep attachment to the ances[illegible] place of patriotism. 'Dharm' [illegible]n to the Mohammedan, means [illegible]gious sanction. In justice to [illegible]t be said that, despite their [illegible]ion, they have shown courage[illegible]mes of danger and charitable [illegible] endowed with means. The [illegible]ng' evinced supreme resolu[illegible]d pugnacious instincts, heredi[illegible]asses, are partly subdued by the [illegible] British rule. Politically the lead[illegible] is this, that the congeries of national[illegible]espite community of faith, have no idea of [illegible]l union or of self-organisation. This renders [illegible]mparatively easy of government by a foreign [illegible] that possesses governing capacity.

[illegible]*ysical Qualities.*—These vary together with [illegible] and climate. The stature is often tall in the north, and short in the south—very much as in Europe. Strength does not depend on height, of course. The Nepálese are short, so are the Mahrattas; both are strong. As a rule, strength with courage is found more in the north than in the south, but least perhaps in the Gangetic delta. Bengal is the only large province that furnishes no recruits to the army. Physical endurance, the power of making protracted bodily exertion with but scanty sustenance, is perceptible everywhere; in some places it is extraordinary, and rarely to be equalled in any country. As a point of comparison, a native has hardly half the strength or nervous force of a European, perhaps not more than one-third; his work comparatively would be in the same proportion. In consequence of this and of the cheapness of living, his wages are not more than one-sixth of the British rate. A proposition of this sort cannot be stated accurately or definitely, but some such truth as this lies at the basis of the political economy of the country.

*Religion.*—Hinduism or Brahmanism is the religion of the great majority of the people, and Mohammedanism comes next. Of the 253,000,000 inhabitants of India, British and feudatory, in 1881, 188,000,000 were Hindus, 50,000,000 Mohammedans, 6,500,000 aboriginal pagans, 3,500,000 Buddhists (almost all in Burma), 1,200,000 Jains, 85,000 Parsees (chiefly in Bombay), 12,000 Jews. In Bengal there are nearly 22,000,000 Mohammedans to 45,000,000 Hindus; in the Punjab, 11,000,000 to 9,000,000 Hindus. The Sikh religion is professed, according to the census for the Punjab, by 1,700,000 of its inhabitants. The Christians number 1,900,000. Buddhism at one period prevailed very generally throughout India; it is now confined to Bhutan, Sikkim, and Burma. See BUDDHISM, JAINS, MOHAMMEDANISM, PARSEES, SIKHS.

*Hinduism.*—The first to be considered is that variety of creeds which is derived from Brahmanic sources, and known as the Hindu religion, or Hinduism. The following summary of the origin and development of Hinduism is from Goldstücker's essay (*Literary Remains*, 1879), originally written for the first edition of this work.

Hinduism may be divided into three periods, the Vedic, Epic, and Puránic, as our knowledge of the first is derived from the sacred books called the *Veda*, of the second from the epic poems the *Rámáyana* and the *Mahábhárata*, of the third from the mythological works known under the name of *Puránas* and *Tantras*. Writers on this subject have marked the beginnings of certain divisions of Vedic works with 1200, 1000, 800, and 600 years B.C. The question of Hindu chronology will be more particularly considered in the article VEDA. Probably the latest writings of the Vedic class are not more recent than the 2d century B.C. Uncertainty hangs over the period at which the two great epic poems were composed, although there is reason to surmise that the lower limits of that period are not far from the beginning of the Christian era. The Puránic period, on the other hand, all scholars are agreed to regard as corresponding with part of our medieval history.

*The Vedas.*—If the *Rig-Veda*—the oldest of the Vedas, and probably the oldest literary document in existence—coincided with the beginning of Hindu civilisation, the popular creed of the Hindus, as depicted in some of its hymns, would reveal the original creed not only of this nation, but also of humanity itself. The Hindus, as depicted in these hymns, are far advanced beyond the starting-point of human society. Indeed they may be ranked among these communities already experienced in arts, defending their homes and property in organised warfare, acquainted even with many vices which only occur in an advanced condition of artificial life (see VEDA). Yet the ideas expressed in the greatest number of the Rig-Veda hymns are neither emanating from an artificial imagination nor largely affected by philosophy. The Hindu of these hymns is engrossed by the might of the elements. The powers which turn his awe into pious subjection are: *Agni*, the fire of the sun and lightning; *Indra*, the bright, cloudless firmament; the *Maruts*, or winds; *Súrya*, the sun; *Ushas*, the dawn; and nature in general. He invokes them, not as representatives of a superior being, before whom the human soul professes its humility, but because he wants their assistance against enemies—because he wishes to obtain from them rain, food, cattle, health, and other worldly goods. He seeks them, not for his spiritual, but for his material welfare. Sin and evil, indeed, are often adverted to, and the gods are praised because they *destroy* sinners and evildoers. But these words are not to be associated with our notions of wrong. A sinner, in these hymns, is a man who fails to address praises to those elemental deities, or to gratify them with the oblations they receive at the hands of the believer. He is the foe, the robber, the demon—in short, the borderer infesting the territory of the 'pious' man, who, in his turn, injures and kills the other. On the whole these hymns, so far from reflecting unfavourably on the internal condition of the Hindu community, seem, on the contrary, to bespeak the union and brotherhood which existed among its members.

The worship of the elementary beings was originally simple and harmless. Most of the Rig-Veda hymns mention but one sort of offering made to these gods. It consists of the juice of the Soma (q.v.) or moon-plant, which, expressed and fermented, was an exhilarating and inebriating beverage. There is a class of hymns, however, to be found in the Rig-Veda in which the instinctive utterance of feeling makes room for the language of speculation; and the mysteries of nature being more keenly felt, the circle of beings which overawe the popular mind becomes enlarged. Thus, the objects by which Indra, Agni, and the other deities are propitiated, become gods themselves; Soma is invoked as the bestower of all worldly boons. The animal sacrifice is added to the original rites; and the horse of the sacrifice especially is invoked by the worshipper.

Mystical language then shows that religion was endeavouring to penetrate into the mysteries of creation. This longing is expressed in other hymns, which mark the beginning of the *philosophical creed of the Vedic period.* The following extract will illustrate the nature of this third class of hymns, as they occur in the oldest Veda: 'Then there was no entity or non-entity; no world, or sky, or aught above it; nor water deep or dangerous. Death was not, nor was there immortality, nor distinction of day or night. But THAT breathed without afflation, single with her who is within him. Other than him, nothing existed which since has been. . . . Who knows exactly, and who shall in this world declare, whence and why this creation took place? The gods are subsequent to the production of this world: then who can know whence it proceeded, or whence this varied world arose, or whether it uphold itself or not? He who in the highest heaven is the ruler of this universe, does indeed know; but not another one can possess this knowledge.'

As soon as the problem implied by passages like these was raised, Hinduism must have ceased to be the pure worship of the elementary powers. Henceforward, therefore, we see it struggling to reconcile the latter with the idea of one supreme being. The first of these efforts is shown in that portion of the Vedas called *Bráhmana*, the second in the writings termed *Upanishad*. In the *Bráhmanas* the mystical allegories are reduced to a systematic form. Epithets given by the Rig-Veda poets to the elementary gods are spun out into legends. A ponderous ritual, founded on those legends, is brought into a system which requires a class of priests. However much this ritual betrays the gradual development of the institution of castes (unknown to the hymns of the Rig-Veda), there are still two features in them which mark a progress of the religious mind of the ancient Hindus. While the poets of the Rig-Veda are chiefly concerned in glorifying the visible manifestations of the elementary gods, in the Bráhmanas their ethical qualities are put forward for imitation and praise. Truth and untruth, right and wrong—in the moral sense which these words imply—are often emphasised in the description of the battles fought between gods and demons. A second feature is the tendency in these Bráhmanas to determine the rank of the gods, and to give prominence to one special god amongst the rest; whereas in the old Vedic poetry, though there may be a predilection to bestow more praise on some gods than on others, yet there is no intention to raise any of them to a supreme rank. Thus, in some Bráhmanas *Indra*, the god of the firmament, is endowed with the dignity of a ruler of the gods; in others the sun receives the attributes of superiority.

*The Upanishads.*—An answer to the question regarding the Almighty is attempted by the 'mysterious doctrine,' as laid down in the writings known under the name of *Upanishads*. Their object is to explain, not only the process of creation, but also the nature of a supreme being, and its relation to the human soul. In the Upanishads the deities of the Vedic hymns become symbols to assist the mind in an attempt to understand the true nature of one absolute entity, and the manner in which it manifests itself in its worldly form. The human soul itself is of the same nature as this supreme or great soul: its ultimate destination is that of becoming reunited with the supreme soul, and the means of attaining that end is not the performance of sacrificial rites, but the comprehension of its own self and of the great soul. Thus the Upanishads became the basis of a comparatively enlightened faith. They contai[illegible] germs whence the three great systems of [illegible] philosophy arose. They advance sufficientl[illegible] express belief in a supreme being, but ack[illegible] the inability of the human mind to c[illegible] its essence. See UPANISHAD.

*The Epics and the Philosophy.*—T[illegible] of *Hinduism is marked by a* d[illegible] two creeds, the general featu[illegible] now been traced in the Vedic w[illegible] lar creed strives to find a cen[illegible] group its imaginary gods, wher[illegible] creed finds its expression in th[illegible] *Sánkhya*, *Nyáya*, and *Vedánt*[illegible] sophy. In the former we find [illegible] ticular who are rising to the h[illegible] and Siva; for as to Brahmá (th[illegible] Brahman), though he was look[illegible] then as superior to both, he gr[illegible] and becomes merged into the ph[illegible] (the neuter form of the same w[illegible] further evolution of the great soul [illegible] shads. In the epos *Rámáyana*, the su[illegible] Vishnu is admitted without dispute; in the [illegible] epos, the *Mahábhárata*, however—which, unli[illegible] former epos, is the product of successive ages[illegible] is an apparent rivalry between the claims of V[illegible] and Siva to occupy the highest rank in the panth[illegible] Already there is a predilection during this E[illegible] period for the supremacy of Vishnu; and the polic[illegible] of incorporating rather than combating antagonistic creeds led more to a quiet admission than to a warm support of Siva's claims to the highest rank. One remarkable myth illustrates the altered position of the gods during the Epic period. In the Vedic hymns the immortality of the gods is never matter of doubt. The offerings they receive may add to their comfort and strength, but are not indispensable for their existence. It is, on the contrary, the pious sacrificer himself who, through his offerings, secures to himself long life and immortality afterwards. And the same notion prevails throughout the oldest Bráhmanas. It is only in the latest work of this class, and more especially in the Epic poems, that we find the inferior gods as mortal in the beginning, and as becoming immortal through exterior agency. In the *S'atapatha-Bráhmana* the juice of the Soma plant, offered by the worshipper, or at another time clarified butter, or even animal sacrifices, impart to them this immortality. At the Epic period Vishnu teaches them how to obtain the *Amrita*, or beverage of immortality, without which they would go to destruction.

The philosophical creed of this period develops the notion that the union of the individual soul with the supreme spirit may be aided by penances, such as peculiar modes of breathing, particular postures, protracted fasting, and the like; in short, by those practices which are systematised by the Yoga doctrine. The most remarkable Epic work which inculcates this doctrine is the celebrated poem *Bhagavadgítá*, which S'ankara, the great philosopher, declared to be founded on the Yoga belief. The doctrine of the reunion of the individual soul with the supreme soul was necessarily founded on the assumption that the former must have become free from all guilt affecting its purity before it can be remerged into the source whence it proceeded. And, since one human life is apparently too short for enabling the soul to attain thereto, the Hindu mind concluded that the soul, after the death of its temporary owner, had to be born again, in order to complete the work it had left undone in its previous existence. This is the Hindu doctrine of *metempsychosis*. The beginning of this doctrine may be discovered in some of the
t Upanishads, but its fantastical development
to the Epic time.

*ránas and the Tantras.*—The Puránic
Hinduism is that of its decline, so far as
creed is concerned. Its pantheon is
same as that of the Epic period.
and Siva remain still at the head
ods. But whereas the Epic time
rised by a friendly harmony
cupants of the divine spheres,
ws discord and destruction of
ence the Epic gods arose.
rom the popular adoration,
va to fight their battles in
ippers for the highest rank.
ich still distinguishes these
and Mahábhárata is now
up with worldly concerns
torical events, disfigured in
dual interests. Of the ideas
es scarcely a trace is visible
antras, which are the text-
Some Puránas, it is true
—make in some sense an ex-
ration from original Hinduism;
compromise between the popular
edánta creed, which latter remains
educated and intelligent. They do
worship of the masses as practised by
sects, whether harmless, as with the
ppers of Vishnu, or offensive, as with the
of Siva and his wife Dúrga. It is this
r creed which, with further deteriorations
by the lapse of centuries, is still the main
n of the masses in India. See PURÁNA and
RA.

philosophical creed of this period, which is still preserved by the educated classes, is derived from the Vedánta philosophy. It is based on the belief of one supreme being, who is invested with all the perfection conceivable by the human mind. But the nature of that being is declared to be beyond the reach of thought, as not possessing any of the qualities by which the human mind is able to comprehend intellectual or material entity. See VEDÁNTA.

The sects which arose during the third period of Hinduism suppose that their worship is countenanced by the Vedas; but its real origin is derived from the *Puránas* and *Tantras*. There are three chief divisions of these sects—the adorers of Vishnu (Vaishnavas), of Siva (Saivas), and of the wives or female energies of these gods (Sáktas). For the philosophy, literature, &c., see SANSKRIT.

*The Popular Faith.*—This must be noted as it is seen among the Hindus to-day. The triad of Brahma the creator, Vishnu the preserver, and Siva the destroyer is still remembered. One of them (Brahma) has lapsed into an abstraction, and practical adoration is divided between the other two. The Sivaites are chiefly, but not entirely, in the north; the Vishnuites in the south. The Sivaite worship is chiefly attracted by the wife of Siva, under various names—Kali, Dúrga, Parbati, and so forth. Vishnu, again, is almost lost in the worship paid to his two incarnations (avatars), Rama and Krishna. Lesser divinities, such as Hanuman, the 'monkey-god,' and Ganésh, the 'elephant-god,' are also honoured. The sanctity of the Ganges (Ganga) remains, and when the river is lost in the delta that sanctity is to some extent continued to the Hooghly, flowing past Calcutta. The Nerbudda also is sacred. The ling or phallus is still an emblem, and gives its name to the Lingayet sect in the Deccan. It is hard to gauge the thoughts of Hindus regarding a future state. They think of a heaven (Swarga) and a hell; also of giant demons (Rakshas). From their demeanour in the presence of certain death it may be inferred that they expect absorption into the divine essence or entity, through the intervention of the god or gods they have worshipped. It is hard to measure the extent to which this faith may have been weakened by the western education of to-day in the minds of the rising generation. The undermining is, however, extensive. Still, in the upper class there are many who cling to Brahmanic orthodoxy, and with the mass of the people the adoration at the temples, the floral and votive offerings, the ceremonies, the festivals, the pilgrimages, are all maintained. The rule of life is still comprehended in the term Dharm, which includes religious fidelity and moral virtue.

*The Caste System*, which is a potent factor in the national life, does not appear to have been a part of the Vedic religion originally. But it arose subsequently with a religious sanction which is still maintained. The Brahman caste, including the priests, is held to have something divine in it. Most of the several millions of Brahmans follow secular employment; but even the humblest of them is hedged round by a certain sort of sacredness. This caste, together with the Kshatri or warrior caste, and the Vaisya or trader caste (including the subdivision of Kayasths or writers), are held to be twice-born (dwija). This character does not attach to the Súdra caste, which includes the masses. The restrictions in respect of food and drink (water) in the caste system are most severe and narrow. Caste is lost from any of the infringements that are inevitable in foreign intercourse. But restoration to caste, though often expensive, is sufficiently facile. Within each caste as a division of the people there are subdivisions infinitely numerous, which as a whole have been reckoned at several thousands.

*The Brahmos.*—But a new religion is arising among the Hindus educated after the western manner: this may be termed Brahmoism or theism, eschewing caste and almost everything Brahmanic. There are already two divisions—Brahmos and Adhi-Brahmos; perhaps other divisions may be formed. Their community is termed the Brahmo Somaj (q.v.). These theistic reformers look primarily to the Vedas, but refer also to the Christian Bible. This intellectual, moral, and spiritual movement may have infinite development under the national education now established, and is to be reckoned among the phenomena of the country. It has been necessary to pass a special law for the marriages of this sect and other sects.

*The Sikhs.*—Their faith, though not quite what it was in the preceding generation, is still a living power. In the Punjab and the protected Sikh states it really was a sort of reformation, and a moral system engrafted on Brahmanism. Otherwise it recognises all, or nearly all, the Brahmanic tenets, caste included. Its sacred book, the Granth, is well known. Its spiritual teachers (Gurus) have a status irrespective of the Brahman priesthood, and it has religious orders endowed with fighting qualities. A man is not born into its system, but is initiated. Practically the initiated ones are all Hindus, who thus become Sikhs or disciples. There are two modes of initiation, something like baptism : the first, that of the foot, practised by the founder, Baba Nának; the second, that of the sword, as practised by Govind Sing, the warlike propagator. The former has more of a religious character, the second is more militant. The popularity of the latter culminated in the palmy days of the Sikh kingdom, when the temple of initiation at Amritsar, near Lahore, was daily crowded.

*Buddhism* is now for the people only a *nominis umbra*; probably the words 'buddh,' as abstract wisdom, and 'nirvâna,' as a haven of celestial quiescence, are remembered. In the Eastern Himalayas, Sikkim, and Bhutan it is really Lamaism (q.v.), or the medieval corruption of Buddhism, of which the headquarters are at Lhasa, in Tibet, with the Dalai Lama and the incarnations. The representations of Buddha or Gautama have the aspect of ineffable repose which Buddhism has everywhere exhibited. The caste system does not exist, but the monastic order is all-powerful. In Burma the faith is still mainly that which was settled at the last great council of Asoka, in northern India, before the Christian era. Here also caste is not acknowledged; but the priestly and monastic orders, though they cannot arrogate a status like Brahmans, are very influential.

*Jainism* is believed to have originally sprung from the same school of speculative thought as Buddhism. It has sacred books and saints of its own, in a long line or series, and it promises a future quiescence hardly distinguishable from annihilation. It has an excessive tenderness for animal life. It recognises caste. Its adherents are largely found in the banking and mercantile classes.

*Mohammedanism.*—This is, in many parts of the country, strictly and exactly preserved, and 'dín,' or orthodoxy, is still a word to conjure with. The two sects, Sunnis and Shiahs, exist in this as in other countries; the dynasties have been mostly Sunní, and the people chiefly belong to that sect, but the Shiahs have always been numerous at Lucknow. In eastern Bengal, however, the faith is much modified and debased, and this remark applies to nearly half of the Moslem population. The ramifications of the fanatical Wahabi sect in Arabia have spread to the Indian empire, thereby causing occasionally political trouble.

The Parsees preserve the Zoroastrian faith and practice—the fire-worship, and so forth. Their 'towers of silence,' inside of which the dead are deposited, are conspicuous objects. There are traces still in India of the old worship of trees—the Bo, the tulsi, and others, and of the serpent (Naga). The aboriginal cult consists of veneration for the great spirit and for malignant powers, including smallpox, and even the tiger, with worship of stocks and stones.

*Religious Endowments.*—The several religions have from time immemorial received endowments from the native dynasties, which endowments are in part maintained under British rule. The value of these endowments consisted in the alienation of the land revenue in favour of religious institutions as grantees. The government has severed itself from any share in the management of these institutions, but it regards the landed endowments as property, and has maintained them after due investigation of tenure, title, and the like.

*Christianity.*—The traditions of St Thomas (q.v.) the Apostle survive in the south, where also a Syrian Church was planted in the early centuries after Christ. In the 5th century Nestorianism came from Babylon, and still survives. In the 16th century Roman Catholic missions arrived from Portugal, and soon afterwards came the famous St Francis Xavier (q.v.) with the Jesuits. The Jesuit missions had great success on both sides of the Peninsula in a certain way, but their ministers were somewhat orientalised. Just two centuries later—i.e. at the middle of the 18th century—the Society of Jesus was broken up in Europe, and the south-Indian missions languished in consequence. Early in the 19th century the society was re-established, and ere long its missions were resuscitated.

The Danish settlement on the south-east coast at Tranquebar saw the first Protestant mis[illegible] which was Lutheran, under Ziegenbalg, in [illegible] He was followed by Schwartz in the Pen[illegible] Towards the end of the century the Baptist [illegible] was set up at the then Danish sett[illegible] Serampore. In the early years of the [illegible] Henry Martyn, the Church of Engl[illegible] began to work as a missionary [illegible] of Calcutta was established in [illegible] followed the operations of the [illegible] tions of the Church of Eng[illegible] Missionary Society and the Soc[illegible] gation of the Gospel. The [illegible] began its missions in 1830, inc[illegible] Church after 1843. These [illegible] missions from the Wesleyan [illegible] munities (British and American) [illegible] Society at Basel, from the L[illegible] Society, and the United Presbyt[illegible] 1835-37 the bishoprics of Ma[illegible] were established, the Bishop of C[illegible] Metropolitan. Recently bishops [illegible] pointed for the Punjab and Sind, and [illegible] besides two missionary bishops for the Penin[illegible] The Church of England is the official ch[illegible] and its chaplains are stationed at the prin[illegible] towns and military cantonments. In many p[illegible] also there are ministers of other denominatio[illegible] Roman Catholic priests are ministering ever[illegible] where, and many of them are salaried by the government as ministers to the European soldiers of their faith. Besides these there are the European ordained missionaries—many hundreds of all denominations—and under these a fast growing native ministry.

The following is the distribution of the Christian population, according to race, in the empire: European, 142,610; Eurasian, 62,085; Native, 893,658; others (including various Asiatic races), 764,172—total, 1,862,525. The following is according to denomination: Church of England, 353,713; other Episcopalians, 20,135; Church of Scotland, 20,034; other Protestants, 138,200; Roman Catholics, 963,058; Syrians, Armenians, and Greeks, 306,552; others, 60,833—total, 1,862,525.

The missionaries have now, for half a century, worked with pastoral devotion, literary labour, and educational efficiency, in western as well as eastern knowledge. They have studied religions, translated the Scriptures into the principal languages, issued numerous works on Christian teaching, supervised schools, founded colleges, managed the cure of congregations. They have long constituted a moral force in the country, with beneficial effect, socially and politically. The increase in the number of native Christians has been proportionally great.

*Social Customs.*—Four-fifths of the population are affected largely by the caste system already described as being partly at least connected with the popular religion. A religious sanction in some degree attaches to infant marriage, or child marriage, with all classes; also to the seclusion of women, and to the prohibition against re-marriage of widows, with the upper and middle classes. In practice the women of the masses are not secluded, but, on the contrary, appear everywhere, and work out of doors; they re-marry, too, if in widowhood. The burning of widows (suttee or sati) on the funeral pyres of their husbands has long been suppressed by the criminal law under British rule. Polyandry is found only among a few of the aboriginal tribes. Polygamy is sanctioned, but not enjoined; it is, of course, confined to those who can afford to maintain more than one wife. Here, again, in practice the masses of the people are monogamist. In all classes the marriage expenses, arising chiefly from the offer-
de to the priesthood, are so excessive as
y to cause embarrassment to families.
the social customs above indicated are
nd deprecated by native reformers as
us to the national progress, and
ts for reformation are made. The
ce, dower and divorce, women's
partition, and other social
ve a quasi-religious sanction.
served in the courts of justice
th for Hindus and Moham-
inal practices have been
y the British government:
rising from the presumed
e murderous and treacherous
ith the goddess of destruc-
or human sacrifices by some

—This is a factor in the rural
l from them has been adopted
. A village does not merely
houses, but corresponds to a
It is an area of some hun-
ds of acres of land, according to
nd is under the administration of
ionaries, the principal of whom is
d-inhabitant), a small local magis-
erintends the affairs of the com-
settles disputes, attends to the rural police
collection of taxes. Among the other
aries may be mentioned the accountant and
*kurnum* or *patwari*), who keeps a register
roduce and the names of the proprietors,
ws up all deeds of sale, transfer, &c.; the
an, or village priest; the schoolmaster; and
atchman. Besides these almost every village
ts astrologer, smith, carpenter, potter, barber,
d bard, all of whom are rewarded out of the
produce of the village-lands. 'Under this simple form of municipal government the inhabitants of the country have lived from time immemorial. The boundaries of the village have been but seldom altered; and though the villages themselves have been sometimes altered, and even desolated by war, famine, and disease, the same name, the same limits, and even the same families, have continued for ages. The inhabitants give themselves no trouble about the breaking up and division of kingdoms; while the village remains entire they care not to what power it is transferred, or to what sovereign it devolves; its internal economy remains unchanged; the potail is still the head-inhabitant, and still acts as the petty magistrate.'

*Costume.*—This is in these numerous nationalities characterised universally by the ease, lightness, and looseness common in the East and suitable to the hot climate. But it varies in the many provinces, and, indeed, with every nationality. The turban (pagri) has every sort of dimension, from minute neatness to turgid massiveness. The waistband (dhoti) extends often below the knee, in which case there is no trouser. Jackets in many styles are common. The women's dress in many respects resembles that of the men. The petticoat is not universal. The head-dress is often extended, so as to hang gracefully down the back. The shoe is not always worn; indeed, the humbler classes are generally barefooted. With them the blanket is often a plaid. The black colours of Europe are seldom seen, but indigo blue is common. Otherwise white, set off by gay margins, and rich scarfs and shawls, is the prevailing colour. As a whole the national dress is picturesque, and a holiday crowd has the appearance of a flower-garden.

*Architecture.*—This is not generally remarkable in the humbler dwellings. In the Gangetic delta the materials are bamboo and thatch, and the cottages, being covered with creepers, are picturesque. In the north both walls and roofs are of indurated earth, the effect being utterly plain. In the south wood and brick are used. The street architecture in the cities and towns is diversified in a manner conducing to pictorial effect. The Europeans have not invented any style for their buildings, except at Calcutta, where the private houses have a stately architecture suited to the climate. Otherwise for their churches they have adopted the Gothic style, and for their civil structures the leading styles of Europe, with certainly a noble, even magnificent effect at Calcutta and Bombay. At Madras, in Rajputana, and elsewhere, they have used adaptations of the old oriental styles.

The indigenous styles of architecture for many centuries have been the chief ornaments of the land. Their study has been greatly elucidated by the Archæological Survey. They begin with the Buddhist era; for the preceding or Vedic era there are no remains. The best authority regarding them is Fergusson, from whose works the following classification is taken. It must suffice to note the salient points only.

*The Hindu Styles.*—In the Buddhist architecture the characteristic features are, first, the Tope (a corruption of *Stupa*, or 'monumental mound'), encased with masonry, having a superstructure at the top, and corridors round the base, with four entrances marked by gateways, often of great beauty; secondly, the Lat or pillar, generally monumental; the Chaitya or hall of worship; the Vihara, or monastery, with cells for the monks. The two last named are often rock-cut, and thus have an extraordinary interest. One tower only, that of Buddh Gya in Behar, has been found, and it is one of the noblest dimensions. Almost all parts of the architecture are adorned with bold yet graceful carvings of men and women, and of animals. In some of the rock-cut chambers or cave-temples are remains of frescoes immensely valuable to the student.

The only living architecture of Buddhism is in the Eastern Himalayas, in Sikkim. There the figures of Buddha are beautifully executed in terra-cotta; and the monasteries are protected from the snow by umbrella-shaped roofs. In Nepál there is one tapering pagoda in the Burmese style. In Burma the circular dagobas have been developed into the exquisitely-tapering pagodas, with gilded surface, and the masonry is set off by wood-carving of the most elaborate description.

In the Jaina architecture the original characteristics were somewhat similar—Jainism and Buddhism being cognate faiths. But simplicity begins to be lost in ornament. Extensive remains are discovered on hill-tops far removed from one another—Parasnath in Bengal, Abu in Rajputana, Satianj in Kathiawar. There is a disposition to congregate small temples in great number on hill-tops, so as to form, as it were, cities of the gods. The general effect of these, however, is not picturesque. The large towers become rounded and ribbed, with a circular addition something like a rose on the apex, surmounted by a finial, so that the general effect is not unlike a spire. Arches and domes become prominent features. Elaborate ornamentation is introduced into the stone masonry. Pillars and lesser towers of great beauty are erected.

The styles which follow are historically Brahmanic. In the Himalayas there are two styles: one in Cashmere, with Hindu affinities, but with greater simplicity of outline and of detail in gray limestone; the other in Nepál, with Chinese and Burmese affinities, the most striking examples being those of temples built in stories, with sloping roofs, copper-gilt, and projecting eaves; the walls being often of enamelled brickwork, and the wood-carving very rich.

The Dravidian style prevails in the southern peninsula, where the Tamil language is spoken. It is called after the old Dravidian race, which has still a distinctive existence in this region. The towers of the temples lose the rounded and spiral forms, and become nearly pyramidal. The temple enclosures have vast gateways (gopuras) of comparatively square shape, though narrowed towards the top. The surface ornamentation, though very fine in some respects, is on the whole grotesquely profuse. At some points, however, the redstone sculptured figures are superb. Granite is largely employed in this style, also the exquisite stucco obtained from shell-lime. The styles heretofore mentioned were devoted almost entirely to religious purposes. But this Dravidian style is adapted to civil uses, and appears in stately palaces, public offices, pavilions, elephant-stables, and so forth. This has been ascribed to the influence of Mohammedan example. The arch becomes prominent; and at Madura especially there is an arched hall of real magnificence.

The Chalukyan style is named after a Hindu dynasty that reigned in the central Deccan. It is found originally in that region, but extended to Mysore, where its noblest works were arrested in their construction by the Mohammedan invasion. Its materials are often of volcanic and granitic stone. The pyramidal shape prevails, and the patient elaboration of surface-ornament excites wonder; but in the general outline stiffness and solidity prevail over gracefulness.

The Indo-Aryan or Brahmanic style is more widely spread than any of the others, extending as it does throughout the northern and central regions. Its examples are varied; many are too small to be effective or significant, but some, such as the group near Jaganath, in Orissa, and that at Brindaban, on the Jumna, are of the grandest type. Artistically the Orissa examples are perhaps the best in the whole country. The forms are influenced by Mohammedan example. The rounded and coroneted tower already mentioned in the Jaina style is found to perfection here. In northern India it is called the Shiwála. This style is adapted not merely to temples, but to cenotaphs for the repose of ashes after cremation, to palaces and summer-houses, to fortresses, to the dams of artificial lakes, to travellers' rest-houses, to wells, and to the spacious reservoirs that are famous under the name of Baoli. The domes and lesser cupolas become frequent. The balconies and windows are much to be admired. One palatial summer-house at Deeg, in Rajputana, is one of the most beautiful buildings of its kind in the world. The modern Hindu work chiefly belongs to this style, and is still going on. In general terms, observation of nature, aspiration for beauty, and artistic feeling have characterised the Hindus—whether Buddhist or Jain or Brahmanic—and imparted to their architectural achievements an art-culture rarely surpassed by any nationality.

*The Indo-Saracenic Style.*—This may be divided into two parts, the Pathan and the Mogul. It begins with the 11th century, and ends with the 15th. The early Pathan style, whether in stone, as at Ahmedabad, near the west coast, or in brick, as at Gaur, in Bengal, far eastwards, consists, with one notable exception, of the Hindu architecture already described, but adapted for a simple worship, and modified with a certain breadth of conception to which the Hindus never attained. The exception is this, that sculpture of the human form is excluded, as being idolatrous. The later Pathan style was based on northern models. Plainness and grandeur are its characteristics, both in the northern and the central regions. The dome, the arch, the minaret are nobly developed; indeed the dome at Bijapur, in the Deccan, i[illegible] grandest object of its kind in the world, [illegible] equally remarkable for structural skill.

The Mogul style began with Akbar [illegible] in the 14th century. At first it [illegible] a somewhat Hinduised form, becau[illegible] princes married Hindu princesses [illegible] became purified from a Mosl[illegible] and resumed the severe simplic[illegible] the later Pathan style, superad[illegible] and dignity never surpassed [illegible] first the materials were red [illegible] intermixed. But by degrees m[illegible] and more, till the culminating [illegible] the Taj Mahal at Agra, was o[illegible] this material, inlaid with [illegible] coloured stones (see illustratio[illegible] this the Pearl mosque (marble[illegible] palace fortresses at Agra and [illegible] mosques at Delhi and Lahore [illegible] most renowned examples.

The Indo-Saracenic style is app[illegible] tombs, it being the practice of the s[illegible] erect his tomb in his own lifetime. Besid[illegible] class and the other classes of structure, [illegible] largely applied to caravanserais and to educ[illegible] institutions (*Madrasas*). In all its later [illegible] it was marked by surface decoration in co[illegible] enamel on earthen material, with hues of w[illegible] the brilliancy and quality cannot be imitated i[illegible] modern times. After the break-up of the Mogu[illegible] empire, a debased modification of the style was introduced at Lucknow. High as was the art culture in the architecture of the Hindu predecessors, it was even surpassed by the Moslem successors.

### III. GOVERNMENT AND MILITARY DEFENCE.

*The Empire.*—Since Queen Victoria was proclaimed Empress in 1877, India is an empire, including the British territories and the native states, or in other words, the Indian allies, feudatories, and vassals of the said empire from the Tibetan and Tartar watershed of the Himalayas to Cape Comorin. It includes, too, every area within their geographical limits, without any exception, except the comparatively small settlements belonging to France and Portugal. The empire is under one supreme authority in India—viz. the Viceroy and Governor-general in Council. It may thus be divided into two categories—the British territories, comprising about three-fifths of the total area, and four-fifths of the total population; and the native states. It will be convenient to dispose of the latter first.

*The Native States.*—The relations between these and the British government are regulated by treaties in full detail. These treaties have been published in many volumes, and form a record of the utmost value to the student of modern India. Some states do not ordinarily appear in the official tables, though they form an integral part of the empire and are in communication with British political agents. In their internal affairs they are uncontrolled. These are the Himalayan states of Cashmere-Jamu, of Nepál, both important, and the lesser states of *Sikkim* and *Bhutan.* The native states which appear in the official tables occupy more than a third of the area of the empire, and contain more than one-fifth of its entire population. *They are thus grouped:*

| Native States. | Area in English sq. miles. | Population, 1881. |
|---|---|---|
| Hyderabad | 81,807 | 9,845,594 |
| Baroda | 8,570 | 2,185,005 |
| Central India | 75,079 | 9,261,907 |
| Mysore | 24,723 | 4,186,188 |
| Rajputana | 129,750 | 10,268,392 |
| ongal | 36,634 | 2,846,405 |
| h-west Provinces | 5,125 | 741,750 |
| ab | 35,817 | 3,861,683 |
| d Provinces | 28,834 | 1,709,720 |
|  | 9,192 | 3,303,563 |
|  | 73,753 | 6,941,249 |
| e States | 509,284 | 55,150,450 |

above is exclusive of Berar,
part of that dominion, with
72,673 population. Further,
of Upper Burma contain an
f 2,000,000, and Cashmere a
neither of which is included

native princes to British
dely. Some are practically
, except that the suzerain
ny of them to make war on
lliances with foreign states;
olerably strict control. As
states under the advice of
*ppointed by the Governor-*
y considerable native court
British agent, political or
re in all about 300 states, allied
and small; they are divided
,000,000 inhabitants), tributary
12,000,000), and protected (about
000,000).
ification is according to the religion
native dynasty:
with a total population of 6,250,000;
£3,300,000; and native armies of
he chief states are: (1) Gwalior or
3,116,000); (2) Indore or Holkar
); and (3) Baroda (pop. 2,185,000).
indu in faith, but may conveniently
distinguished from the other Hindu states. See
MAHRATTAS.

II. Hindu, nearly 100 in number, with a population of 27,000,000; a revenue of £8,000,000; and native armies of 188,500 men. Of these the chief are: (1) Mysore (q.v.; pop. 5,000,000); (2) the Rajputana states, such as Udaipur or Mewar (pop. 1,200,000), Jeypore (pop. 2,000,000), Jodhpur (pop. 2,000,000), and some 14 smaller states; (3) the Madras states, such as Travancore, Cochin, Pudukota; (4) the Bombay feudatories, over 30 in number; (5) the lesser states of Central India, including Rewa and Bundelkhand; (6) Punjab states, including the protected Sikh states, ten larger and five smaller, Patiala being the largest.

III. Mohammedan, with a pop. of 14,000,000; a revenue of £5,000,000; and armies of 75,000. The greatest are: (1) Hyderabad of the Deccan, or the Nizam's Dominions (q.v.; pop. 10,000,000, of whom three-fourths are Hindus, though the dynasty and military power are Moslem); (2) Bhopal (pop. 800,000, nine-tenths Hindus by faith); (3) Bahawalpur (pop. 500,000); (4) Some nineteen others with a collective pop. of 2,000,000.

IV. Frontier, mainly Himalayan and eastern Bengal.—*(1) Cashmere with Jamu (pop. 1,500,000);* (2) the Pathan (Afghan) tribes; (3) Manipur (pop. 200,000); (4) Bhutan (pop. 200,000); (5) Nepál (pop. 2,000,000).

The feudatory states (excluding Nepál, and without counting small states with an aggregate of about 1,000,000 inhabitants, which have no armies) have together armed forces amounting to 350,000 men, and 4300 guns. The flower of this army has on recent occasions been placed at the disposal of the British government as paramount, and is virtually a part of the imperial forces.

The sum total of these four categories would bring the population up to 60 millions, and the total revenue to 15 millions sterling annually. These states are loyal to the British crown as paramount and suzerain. Their loyalty was proved during the imperial crisis of 1857-58. In the aggregate they form a preservative and constitutional force in the country. The British government takes a paternal interest in the welfare and good government of these states. Misgovernment is effectually prevented. Colleges and schools under British auspices are established for the education of young native princes.

As descendants are frequently wanting in these old families, it was important that the principle of adoption should be recognised, otherwise the state might on the demise of the native prince without issue lapse to the British government as paramount. All fears on this account were set at rest by a decree in 1858 sanctioning the right of adoption according to the Hindu or Mohammedan institutes.

*The British Territories.*—These, containing 868,314 sq. m. and 198,790,853 souls, are broken up into eight divisions for civil government. They were originally in three divisions, called presidencies, which have become historic—viz. Bengal, Madras, and Bombay. The old presidencies of Madras and Bombay still survive as units of government under governors in council as of yore; but every area that does not specifically belong to them is considered to belong to the Bengal Presidency. The last-named presidency, being much the largest of *the three, has been subdivided into several* divisions. Of these subdivisions the three principal are Bengal, with Behar and Orissa; the North-western Provinces, with Oudh; the Punjab, with Delhi. Each of these is under a *lieutenant-governor.* The three remaining subdivisions are the Central Provinces, Assam, and Burma, each under a chief-commissioner; of these the Governor-general in Council is technically the governor, but he delegates the greater part of his powers to the chief-commissioner in each case.

The subjoined table thus shows these main territorial divisions, with their areas and populations :

| Presidencies. | Provinces. | Style of Government. | Area in sq. m. | Population. |
|---|---|---|---|---|
| BENGAL | Bengal, Behar, and Orissa | Lieutenant-governor. | 150,588 | 66,691,456 |
| | North-western Provinces and Oudh | " " | 106,111 | 44,107,869 |
| | Punjab and Delhi | " " | 106,632 | 18,850,437 |
| | Central Provinces | Chief-commissioner. | 84,445 | 9,838,791 |
| | Assam | " " | 46,341 | 4,881,426 |
| | Burma | " " | 87,220 | 3,736,771 |
| MADRAS | Madras | Governor in Council. | 139,900 | 30,868,504 |
| BOMBAY | Bombay with Sind | " " | 124,192 | 16,489,274 |
| | | Total | 845,429 | 195,464,527 |

Besides these there are three small detached territories—viz. Ajmere (in Rajputana), Coorg, and the Andaman Islands. All this is exclusive of the Berar province, which, though under British administration, is a part of the Nizam's dominions.

These figures, large as they are, fail to give a definite impression of the enormous area and population under British authority in this part of the globe. The districts under direct British administration have an area almost quite as large as that of the United Kingdom, Austria-Hungary, Germany, France, and Italy together, or more than seven times that of the United Kingdom. The area of the native states is as large as Norway and Sweden, Spain, Holland, and Belgium put together. In population British and feudatory India together have more than all European states together, omitting Russia only. The British territories (without the native states) contain nearly one-seventh of the inhabitants of the entire globe.

*Machinery for governing.*—In 1858 the government was transferred from the East India Company (q.v.) to the crown. In 1877 the Queen assumed the title of Empress of India (Kaisar-i-Hind). The government of India is in the highest resort *invested in a Secretary of State in London*, who is a member of the cabinet, and has a parliamentary under-secretary and a council of ten to fifteen members. The executive government in India is administered by the Viceroy and Governor-general in Council, acting under the control of the Secretary of State for India. The Viceroy and Governor-general, appointed by the crown, is assisted by an executive council, consisting of six ordinary members (appointed by the crown), each of whom has charge of a department of the executive; together with one extra-ordinary member, the commander-in-chief of the army. This council virtually sits as a cabinet. The legislation for the empire is conducted by a 'legislative council,' composed of the members of the executive above mentioned, together with members from six to twelve in number appointed by the Viceroy and Governor-general. Such is the mechanism of the government of India.

In the several subdivisions of the Bengal Presidency the lieutenant-governors and the chief-commissioners above described, in their executive capacities, rule individually. But two of them, the lieutenant-governors of Bengal and of the North-western Provinces, have legislative councils for provincial legislation. The lieutenant-governors and the chief-commissioners are mainly chosen from the civil service of India. The members of the legislative councils are all appointed, the elective principle not having been as yet introduced. Madras and Bombay are under governors appointed by the crown. Each of them has an executive council, sitting as a cabinet, also appointed by the crown, and a legislative council. With the governor-general, the governors, the lieutenant-governors, and the members of council, the tenure of office is for a term of five years. There are proposals for enlarging the several legislative councils.

The country is divided into territories technically designated 'regulation' and 'non-regulation.' In the non-regulation territory originally more discretion was allowed to the officials both in the collection of revenue and in the administration of justice. But of late the distinction practically amounts to little more than form, and is technical chiefly. In the regulation districts the judicial service is distinct; in some of the non-regulation it is not. The lieutenant-governorship of the Punjab and the several chief-commissionerships are non-regulation; so are some few outlying tracts elsewhere. The rest of the country is regulation.

*The Units of Administration.*—The larger units are the districts (generally called collectorships in English and *zillahs* in the vernacular), of which there are in all the provinces above mentioned about 234. Each district, if in regulation territory, is under a collector-magistrate; if in non-regulation territory, a deputy-commissioner. The head of the district has most multifarious and responsible duties; he is fiscal-officer, charged with collecting the revenue, as well as magistrate, and besides superintends police, gaols, education, sanitation, and roads. In parts of the non-regulation territory he is also the civil judge, but not in regulation territory. The subordinate officers are deputy-collectors and *assistant-magistrates*. The district may be compared to an English county or a French department, and varies in size from an are[illegible] taining 3,000,000 inhabitants to one wit[illegible] 50,000. Within the district the lowest un[illegible] village or parish (*mouzah*), according to th[illegible] system already described. There are ab[illegible] such villages or parishes in the Bri[illegible] In all the divisions of the empire [illegible] the districts are formed into [illegible] each group, under a commissio[illegible] are more than fifty.

*The State Services.*—The ad[illegible] ducted by members of the [illegible] (formerly called the covenant[illegible] ity of whom are European[illegible] natives. The service is recr[illegible] cessful candidates at compe[illegible] held in London; but some [illegible] allowed to enter the service [illegible] these are called statutory. To [illegible] the higher administrative appoi[illegible] by act of parliament. The lo[illegible] (formerly called uncovenanted), ap[illegible] which are mostly made by the authori[illegible] is composed of Europeans, Eurasians (th[illegible] of native mothers by European fath[illegible] natives. Some of the Europeans are ap[illegible] England, especially those who belong to [illegible] departments. The organisation of the [illegible] branches of the civil service, with pay, promo[illegible] and pension, is a feature in British rule, and together with the state education, is beneficially affecting the national character. Thus, while the direction is in European hands, the great mass of civil officials consists of natives.

*The European Community.*—Existing mainly at Calcutta, Madras, and Bombay, this body consists of the merchants, manufacturers, barristers, lawyers, and other professional men. This non-official body, together with the official body, constitutes a force of independent opinion, which is a factor in the progress of the country. It is supported by an English press. The newspapers are published not only at the presidency cities, but also at all the provincial capitals.

*The Army.*—In 1859 the troops of the East India Company became the Indian military forces of the British crown. The established strength stands at 218,729 officers and men. Of this total 145,177 belong to the native army, and 73,552 are European troops of the regular British army. In the total of the native troops a limited number of European officers is included. The forces are divided into three military divisions or armies, named after the three old presidencies of Bombay, Madras, and Bengal. Of the native troops 83,883 belong to the Bengal army, 32,649 to the Madras army, and 28,640 to the Bombay army. The European forces are chiefly stationed in the Punjab and along the valley of the Ganges. Of these troops 53,695 are infantry, 12,993 artillery and engineers, and 5679 cavalry. Out of 103 batteries of artillery 88 are manned by European gunners. The power and mobility of the army have been vastly augmented by the railway system hereafter to be mentioned, especially in the direction of the fortified military posts on the north-west frontier. The old forts, which are also arsenals and magazines, are maintained at Madras, Bombay, Allahabad, Delhi, Agra, Lahore, and elsewhere. Fort William at Calcutta was scientifically constructed early in the century. The barracks for the European troops have been reconstructed on modern principles, and are among the best structures of their kind to be found in any country. The native troops are recruited by voluntary enlistment, with good prospects of pay and pension, from all nationalities and from all castes, Brahmans or others. Though
ments are commanded by European officers,
native commissioned as well as non-com-
officers. Both classes are usually drawn
ks. The drill and discipline are Euro-
eering is largely in vogue among the
nities in the capital cities, on the
ailway, and elsewhere. Several
formed, which constitute an
nore than 18,000 men to the
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he first class of harbours in the
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to be approached by eighty miles
ion, which can be conducted only
-long training; and it is therefore
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Irawadi, has a similar advantage,
degree. Kurrachee, near the mouth
though good, is not large enough for
e of its situation. To these should
en, which, though a plutonic promon-
Arabia, commanding the entrance to the
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e fortification and an imperial coaling
see COALING STATIONS).

reat steam-navigation companies, with
ters in London, but plying in eastern waters, form an addition to the maritime resources of the country for war or other emergency. Their ships, though officered of course by Europeans, are manned chiefly by Mohammedans from the coast districts (Lascars), who are excellent sailors.

## IV. CIVIL ADMINISTRATION.

*Law and Justice.*—The fundamental institutions of the Indian empire have been established by parliament in a series of statutes. The regulations of the East India Company provided for civil procedure, leaving the native laws to be observed in social affairs, and British justice to be followed in other affairs. The supreme courts established by the crown in the presidency towns of Calcutta, Madras, and Bombay, towards the end of the 18th century, administered the English law. In 1833 the English government set up a commission to frame a body of substantive law, civil and criminal, for the British-Indian territories. This commission and its successors laboured up to a recent time; and with their help a penal code, a civil procedure code, and several other fundamental laws have been passed. The legislative work, both civil and criminal, is highly scientific as well as practical, and is framed after the best models to be found anywhere. In 1853 a legislative council in India was set up. In addition to this several local legislatures were established in 1861, and these may hereafter be enlarged. About the same time the supreme courts were abolished, and in their stead High Courts were established to control the whole administration of justice inside and outside the presidency towns. Great care has within the last generation been taken with the organisation of the native judicial service under the supervision of the European civil service. Courts of various grades (over 2000 altogether) exist in all parts of the districts already described, so as to be accessible to the people. In such a society as that of India there must needs be defects and shortcomings in the judicial system, but on the whole it commands popular confidence, as is proved by the extent to which it is brought into use. In 1880–89 the number of civil suits in the whole country has risen from 1½ to 2 millions annually, and the value from 14 to 20 millions of tens of rupees. Of these about two-thirds are for small sums of less than £10. In the criminal department about 1¼ million of crimes and offences are reported annually; for these cases about 1⅓ million persons are brought to trial, of whom over half are convicted. The suppression of gang-robbery and other crimes of overt violence forms a marked feature of British administration—besides the extinction of the criminal practices mentioned under the head of *Social Customs*. See the *Anglo-Indian Codes*, ed. by Whitley Stokes (vol. i. 1887).

*Police and Prisons.*—The regular police include a force of 160,000 officers and men; the cost of 15,000 is defrayed by municipalities, and of the remainder by the state. Further, there are besides the village watchmen, about 560,000, corresponding to the number of villages. The constabulary is a native force, the principal officers only being Europeans. It is subject in all respects, except internal discipline, to the magistracy, and in each province is under an inspector-general in each division of the empire. There is one regular constable to 7 sq. m. and 1300 inhabitants—which indicates the peaceful habits of the people. Great care has been taken in the scientific construction and supervision of a prison in almost every district. There are upwards of 230 prisons, with about 82,000 prisoners, inclusive of 12,000 transported to a convict settlement at the Andaman Islands.

*Education.*—The existing system may be dated from 1854, though various efforts had been made long before that date. Compulsory attendance has not yet been enacted. Still the attendance at school is considerable, though nothing like what it may yet become. There are three principal universities, at Calcutta, Madras, and Bombay, each having many affiliated colleges; there are also two new universities in the North-western Provinces and the Punjab. These institutions are successful, save in one respect—that very many enter them who do not take degrees; about 14,000 pass the entrance examination annually, of whom less than 3000 take degrees. The educational institutions are of several kinds, public, aided, private and unaided; all together they amount to 134,000 in number, with 3½ millions of scholars. These numbers, though actually large, are not so relatively to the population. Of these students not more than one-twelfth consists of girls. The income comes from various sources, government grants, and provincial revenues, local rates and cesses, municipal funds, and fees paid by the parents; the total amounts to 4½ millions of tens of rupees annually, and the expenditure is, of course, commensurate. The English language, with all the western literature, arts, and sciences, is taught to the upper students everywhere. Much, however, remains to be desired in respect to physical science, and technical instruction is still in its infancy; the native mind seems as yet to lean towards literature rather than the exact sciences, towards the cultivation of the memory and the imagination rather than of the reasoning faculties. But intellectual assiduity is evinced in a commendable degree. There are numerous missionary colleges. Schools of art have been organised in the capital cities; there is an imperial museum at Calcutta, and museums in all the chief cities and towns. The native languages, both classical and vernacular, are also cultivated sedulously. A vernacular literature of primers and elementary works, also of more advanced works, chiefly translations, is springing up under the auspices of the British authorities, vast numbers of such works appearing annually. In the whole country there are about 400 newspapers in the various vernacular languages. Their total circulation is not very great, the largest circulation of any journal being 20,000 copies. They enjoy virtually a complete freedom.

*Post-office and Telegraphs.*—There are 12,000 post-offices and letter-boxes in the Indian empire, with 41,000 men employed. The number of letters, newspapers, parcels, and packets is in all 275 millions annually. This number is fast increasing; though large actually, it is not very considerable in relation to the population. There are open 32,000 miles of inland telegraph lines, with nearly 3 millions of messages annually. This number is exclusive of the submarine cables.

*Trade.*—The following figures are taken from the Indian returns, which, owing to differences in valuation and exchange, do not agree exactly with the English returns. The imports in 1887-88 by sea were valued in tens of rupees at 65 millions merchandise (including government stores), 14 millions treasure, total 79; the exports at 90¼ millions merchandise, and 1¾ million treasure, total 92. (In 1887-88 the rupee was approximately equal to 1s. 4½d.) Thus the grand total of imports and exports stood at 171 millions. Of the imports more than four-fifths, and of the exports more than half, pass by the Suez Canal. Again, of the imports nearly all come from the United Kingdom; but of the exports, while more than one-half goes to the United Kingdom, a considerable portion is sent to other countries. Of the imports the principal item consists of cotton goods; the next most important is that of metals; other important items are machinery, railway plant and rolling-stock, manufactured silk, sugar, and woollen manufactures. Among the exports there is no preponderating article like cotton goods among the imports; but the principal items of export are coffee, raw cotton, cotton twist, yarn, manufactures, dyes, grains, including rice and wheat, hides and skins, jute, raw and manufactured, seeds (oil chiefly), tea, wool. The growing exportation of food-grains in vast quantities has disturbed or dissipated any notion to the effect that the increasing population might be in want of sufficient sustenance. Of shipping, 10,893 vessels, with a tonnage of 7,189,465 tons, entered and cleared the ports; of these almost the whole were British, a small fraction only being foreign. All this is exclusive of coasting trade, valued at 80 millions annually, with smaller craft along a coast-line of 7000 miles and more, with 300 harbours, mostly small. There are influential chambers of commerce at the principal seaport towns, mixed bodies of Europeans and natives.

*Communications.*—The length of railways open for traffic may be stated thus (for 1888-89): guaranteed companies, 3243 miles; assisted companies, 653; state lines, 10,410; native states, 939—total, 15,245. The total number of passengers on all these lines in 1888 was upwards of 103 millions; the quantity of goods conveyed upwards of 22 millions of tons. The gross receipts of all these lines were close on 20 millions (tens of rupees). The net earnings, after defrayal of working expenses, were nearly 10 millions.

Road-making was being vigorously prosecuted, but became somewhat superseded by the introduction of railways. Several magnificent trunk-lines have been constructed. Of the total length in the whole country (60,000 miles) about one-third has been bridged and macadamised. Similarly the railways compete with the old boat traffic on the great rivers. This traffic, however, exists to a wonderful extent in eastern [illegible] where the boats of varied size and build [illegible] conspicuous feature in the country.

*Manufactures.*—These, whether in m[illegible] fibres, have always been very fine, [illegible] maintained. The local manufa[illegible] goods are very extensive. The [illegible] all sorts are mostly kept up. [illegible] however, has during the 19th c[illegible] development of indigenous ma[illegible] other hand it has stimulated [illegible] especially in jute and cotton [illegible] Bombay, organised on the [illegible] British capital and directi[illegible] labour, have been consider[illegible] threaten to enter into competi[illegible] market. A factory law, on the [illegible] but not exactly with English [illegible] passed in 1881.

*Irrigation and Canals.*—This s[illegible] to climatic exigencies attained v[illegible] Native dynasties have all distinguished [illegible] in this direction; drought and famine ha[illegible] urged every government to action, and the [illegible] been taken up by the British government [illegible] western skill and capital. The Ganges cana[illegible] its branches, the canal systems of the deltas [illegible] Mahanadi, the Godavari, the Kistna, and the [illegible]veri, are among the greatest works of their kind in the world. Great canals are drawn from the five rivers of the Punjab, and the Indus is to Sind what the Nile is to Egypt. These irrigation canals are but little used for navigation. The total length of these and their branches is calculated at 14,000 miles. Besides the canals there are in many districts artificial lakes; wells also for irrigation are found in most of the valleys everywhere. The irrigated area in its grand total is reckoned at 28 millions of acres, of which over 8 millions are watered from canals. The capital outlay on this enormous system cannot be estimated, but the British government has in this way laid out 31 millions of tens of rupees, besides sums spent yearly out of current revenue. The embankments along the Lower Indus and in the Gangetic delta for restraining floods are very extensive, having a total length of about 1500 miles.

*Famine Relief.*—All this bears on the prevention of famine by state aid. Owing to extensive failures of the monsoon rains at periodically recurring intervals, droughts and famines have occurred. Though the natives bore up against their misfortune with admirable fortitude, and brought out reserves of food such as few nationalities could produce, and though the authorities put forth strenuous efforts, yet the loss of life has been sometimes tremendous. In 1874 the principle was followed of devoting the entire resources and power of the government to the mitigation of distress or the saving of life. In years of plenty a sum varying from 1 to 1½ million sterling is set aside out of current income to meet the cost of relieving distress in time of famine. During the period 1874-80 £16,000,000 was expended on this humane object.

*Municipalities.*—Municipal corporations (at Calcutta and Bombay elected by the ratepayers) have been established in all the cities and large towns of the empire, their total number being nearly a thousand. The population under their jurisdiction amounts to 14 millions of souls; their annual income to 2¾ millions of tens of rupees; and their debt to nearly 5 millions.—In many districts the establishment of district boards, by popular election, for purposes resembling those of
government in England, has been under-
e 1880.

*tatistics and Sanitation.*—This subject
ny years past received systematic atten-
ater-works at Calcutta, Bombay, and
nk high among works of this char-
try of the world; and the purifica-
water in many centres of popu-
y affected the public health.
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ssistants has for many years
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g to the excessive density of
parts of the empire, govern-
many years past encouraged and
emigration to the tropical and sub-
lonies, with varying and only moderate
the whole. In the decade 1880-89 the
to the Mauritius has amounted to 7538
, 8057; British Guiana, 30,142; British
es, 39,304; Fiji, 6802; French West
ies, 8712; Surinam (Dutch), 6453—total, 107,008.
There is also a considerable migration from the plains and low hills of the central regions to the rice-plains of Burma, and also to the tea-plantations in Assam and in the Eastern Himalayas.

*Finance.*—The currency is in silver rupees, which alone are legal tender; the subordinate parts of the rupee being sixteen annas, and those of the anna being twelve pai (pies) in copper. The monetisation of silver as sole legal tender to an unlimited amount dates from 1835. There is also a government paper currency, legal tender, amounting to about 16 millions sterling in value. The rupee is nominally equal in value to two shillings; and in former days ten rupees were held equal to a pound sterling. While for Indian purposes the finances were generally exhibited in rupees, of which the higher numbers were a lakh or 100,000, and a crore or 100 lakhs, yet for English purposes they were always exhibited in sterling money; thus, a lakh was reckoned as equal to £10,000, and a crore as equal to a million pounds, and for many years the Indian accounts were exhibited in England in sterling by the process of dividing the rupee totals by ten. In the then relative values of gold and silver this plan answered well, for generally ten rupees were really equivalent to one pound or thereabouts. But during recent years, owing to the depreciation of the rupee, which has fallen at times to below one shilling and fivepence in the exchange, this plan is no longer possible. So now the Indian accounts for England are shown in tens of rupees (or R.x.) whereby the comparison between the figures of recent and of former years is maintained. The finance, then, is shown thus in tens of rupees, for gross revenue and expenditure, excluding capital expenditure on public works. The expenditure is incurred chiefly in India, but partly also in England for India.

| Year. | Gross Revenue. R.x. | Expenditure. R.x. |
|---|---|---|
| 1886-87 | 77,337,134 | 77,158,707 |
| 1887-88 | 78,759,744 | 80,788,376 |
| 1888-89 | 81,696,078 | 81,669,000 |
| 1889-90 | 84,036,300 | 82,826,000 |
| Estimated 1890-91 Budget. | 84,032,100 | 84,061,700 |

There are alternations of surplus and deficit; and, after putting one against the other, there has been a surplus during the decade 1881-90. The expenditure has been greatly increased of late years by the depreciation of the rupee. The payments annually to England amount to about 16 millions sterling—for interest on debt, pensionary allowances, and other charges. This sum adjusted in gold has to be paid by the Indian government, which has no money save silver; and in the low state of the exchange these payments become excessive and embarrassing. In order to discharge an obligation of 16 millions sterling India has to remit 23 millions of tens of rupees; thus it is estimated that, as compared with former years, the depreciation of silver has imposed on her a burden of some 7 millions annually (in tens of rupees). The main heads of taxation may be set down in tens of rupees, thus: land, about 23¾ millions; opium, 8½; salt, 8¼; stamps, 4; excise, 4¾; customs, 1½; assessed taxes, 1½; provincial rates, 3½. The grand total of receipts and expenditure has of late years been swollen by the inclusion of the receipts and charges pertaining to the railways.

Excluding the opium, which is really paid by the Chinese (see the paragraph on opium revenue below), the taxation above summarised amounts to nearly 47 millions, and falls at the rate of four shillings per head per annum, which is light. Of the expenditure above set forth, there are 23 millions for the army services, which is about equal to the charges for the civil services of all sorts, exclusive of interest. Besides all this, there is a capital account of outlay from borrowed money on productive works, railways, and canals of irrigation. From 3 to 5 millions annually are thus laid out by the state, besides a nearly equal sum by guaranteed or assisted railway companies.

*Public Debt.*—The debt thus incurred stands at 92 millions for railways and 27 for canals; in all 119. Besides this there are nearly 80 millions for other purposes, mainly war. The sum of the two amounts to about 200 millions. Of this sum 105 millions (in tens of rupees) are in India and 95 in sterling are in England. There are also obligations styled 'unfunded debt,' consisting of treasury notes, savings-bank deposits, and other items, amounting to 9¾ millions. Further, there were more than 90 millions of capital outlay by railway companies, on which the interest was guaranteed by the government. But this has been modified by the fact of government having recently purchased some of these guaranteed lines. The interest charges annually may be shown thus: on railways, state, 3⅓ millions tens of rupees; guaranteed, 3¾; irrigation canals, 1; other heads, 5½. The rates of interest have been reduced in recent times, and now range from 3 to 4½ per cent.

*Banks.*—There is a state or presidency bank with various branches at Calcutta, at Madras, and at Bombay, or three in all. The system of small savings-banks has been greatly extended by the government; there are 6151 such institutions, and 331,711 depositors, with a balance of 6,577,737 tens of rupees. The native bankers, between 200,000 and 300,000 in number, form a numerous community that ramifies all over the country, with a well-established system of bills of exchange (Hundi). A plan of life insurance by government has been established for the natives, the effect of which may be considerable hereafter.

*Land-taxation and Land-system.*—This claims notice on social and economic grounds as well as fiscal. The tax is collected in money instead of in kind, as was often the case under native rule. It consists of a portion taken by the state from the agricultural rent—and much the smaller portion. Apart from this, the incidence of tax on the value of the gross produce is reckoned to range from 4 to 10 per cent. in the several provinces of the empire. In all these provinces, except Bengal and Behar, for the assessment of the tax a survey of every field, besides a general survey of every village, has been made. In every village there is a register showing the ownership, occupancy, rights, and interests in every field. This is revised yearly, and called the Record of Rights. This cadastral survey and this Domesday Book for so vast a country, executed by the British government, together constitute the largest operation of the kind ever undertaken in any age or country. Thus the government has either conferred *de novo* on the people, or recognised as belonging to them from antiquity, something which is equivalent to property in land, whether such property existed under previous native rule or not, which is sometimes doubtful. This property is attended by transactions of sale, mortgage, trust, loan, security. The land-tax is the first charge on it; but it is rendered valuable by the moderation in the assessment of the tax.

As regards the land-system, there are several tenures, varied by the conditions under which the tax is fixed. The first is that of fee-simple after redemption of the tax, under which government lands are sold to European planters of tea or coffee, and others. The next is that where the tax has been fixed for ever, in Bengal, Behar, Benares, and part of Madras, and is styled Zemindari. The tenure in Orissa, Oudh, Sind, and the Central Provinces is similar, save that there the tax is fixed for twenty or thirty years. Next is the peasant proprietary tenure of the North-western Provinces and the Punjab, where the tax is fixed for thirty years, and the proprietors are grouped together in their villages as communities or coparcenaries: this is styled Mouzahwari. Resembling this in all respects except one is the Ryotwari tenure of Madras and Bombay—the exception being this, that the Ryot or peasant-proprietor is assessed individually for each field he holds. Similar to this is the tenure in Assam and in Burma. The village organisation is almost everywhere preserved.

Below the land-owners, great and small, are the cultivators. They are divided into two categories, the occupancy tenants and the tenants at will. The former inherits his tenure, but as a rule cannot sell it without the owner's consent. He is protected by law against exaction and from interference or eviction, so long as he pays the customary or stipulated rent; and generally his rent cannot be increased against his will without a decision of a court of law.

*Opium Revenue.*—This is for the most part levied on the exportation of the drug to China; the very small portion consumed in India is taxed under the head of excise. The tax on the exported drug from Calcutta amounts to 6¼ millions. The cultivators of the poppy are in British territory; they bring their produce to the government factory, and thence it is sent to the seaport, where it is taken up by the exporters. These arrangements are made to secure the revenue and to prevent illicit consumption. The tax on exportation from Bombay amounts to 2¼ millions. The produce is raised in the native states of Malwa and Rajputana.

The *salt-tax* is derived from salt partly obtained on the sea-coast of Madras and Bombay, partly from the salt lake in Rajputana, partly from the rock-salt in the Punjab, and partly imported from England. It is the only tax universally paid by the poor, and falls at the rate of sixpence per head per annum on the population.

*Excise.*—The farming system which us[illegible] prevail in the excise on drugs and spirits, [illegible] manufacture of which the materials are [illegible] everywhere in superabundance, has [illegible] demned as likely to lead to the e[illegible] of drinking with a population th[illegible] temperate. This is being super[illegible] system, known as that of central[illegible]

*Wages and Prices.*—As genera[illegible] and prices have risen under [illegible] labourer of the better class [illegible] (sixpence) a day, the humbl[illegible] annas. The price of food-[illegible] taken at one penny for 2 lb. [illegible] a fair sustenance. In a fa[illegible] children earn some wages. [illegible] and cheap; fuel but little need[illegible] without payment. Rent for co[illegible] known. The masses of the rur[illegible] ever, are not labourers, but liv[illegible] either as owners or occupants. In[illegible] are not assessed to income-tax, w[illegible] of 2½ per cent. yields 1½ million, and [illegible] sents a taxable commercial and profession[illegible] of 60 millions—greatly less than that of [illegible] with a population only one-fifth as large. [illegible] there is not, and never has been, anything [illegible] poor-law; nor is there any apparent need for o[illegible]

### V. The History.

*Phases of Civilisation.*—With a country of 1¼ million of sq. m., containing a population of 270 millions, of many languages and nationalities, with traces reaching backwards more than three thousand years, an historical summary would become an Indian jungle of names and dates unless it were arranged on a plan and guided by some leading ideas. Without such a method no lesson from the facts would be conveyed. Now, in these days a

strange and complex civilisation is perceived in the Indian empire, and the student should inquire by what steps through the ages this has been brought about. At the basis of this immense social fabric is the prehistoric status of aboriginal races. Of these races many an indication is still perceptible, and of them some are still surviving. This status was largely affected by inroads, Dravidian and other, from central Asia, many centuries before the Christian era. From one of these invasions, which was Aryan, sprung the early Hindu or Vedic system. Whether any previous invasions had introduced civilisation or not, this Vedic system certainly was a civilised one. This became overlaid with corruptions, and was reformed by the Buddhistic system some five or six centuries B.C. Then came the Greek invasion under Alexander the Great and some of his successors, which affected only the north-western parts of the country. It was followed by other invasions from central Asia, some styled Bactrian, others Saka or Scythian, which extended much farther than the north-western regions. Meanwhile Buddhism had strengthened and extended itself till it obtained the sovereignty over the whole country. Thus established as a state religion, it lasted for some centuries after the Christian era. Then it gave way to the old Hindu system, revived under an elaborated form which should be styled Brahmanism, and which represents the modern Hinduism. Brahmanism after its re-establishment in the 6th century flourished till the 11th century A.D., when the first Mohammedan invasion took place. This was followed by successive invasions, till the greater part of the country was subdued and parcelled out into
rious Mohammedan kingdoms. Many of these
ms were subdued by one Mohammedan
known as the Mogul. Thus the Mogul
vas established, embracing most parts of
, in the 15th century. It lasted for
o centuries, and then began to shrink.
ipitated by the rise of the Mahrat-
about a revival of Hindu power
e Mogul dominion in the 17th
e European influence was be-
Portuguese, Dutch, French—
but not far in the interior.
British influence, which was
e of the 18th century, and
19th had spread over the
he land, being soon after-
ned as the Indian empire.
-day are to be found traces
ondition with some Dravi-
) a civilisation early Hindu
nist, (*d*) Greek, (*e*) Bactro-
Buddhist, (*g*) Brahmanic or
Mohammedan, (*i*) Mahratta,
opean, and (*k*) British. The
vill briefly indicate the course
aing the several stages in the
he development of the mixed
is seen to-day.

*ginal.*—This is prehistoric, and is both
tten record and also without coins or
s; but there are philological traces and
uments. Roughly, it may be said that
ere at least several aboriginal races, and
cursions of tribes from without took place—
ke subsequent invasions, from the north-
but from various quarters by sea and land.
e stone monuments are found, and sepulchral remains with primitive implements have been excavated in several parts of the country widely distant from each other. These are of the highest antiquarian interest. They hardly indicate civilisation, but they prove at least a social organisation of a semi-barbaric character. The population was sparse; the face of the country was a primeval forest, dotted about with cultivation and habitations. The stature of the people was small, the skin dark, and the features of a Tartar cast, with broad cheek-bones, low forehead, nose small, mouth somewhat large. Upon this people, whatever it may have been, two inroads were made, one by a race known as the Kolarian, now represented by the Sonthals, the Bhils, and other tribes; the other, from the north-west, called the Dravidian. The origin of the Dravidians is still doubtful. They must have had some civilisation which spread over the whole country, and which, though absorbed by some subsequent systems in the north, is still traceable in the south. Their race in its ruder form is still represented by hill-tribes, Gonds, Khonds, and others.

*The Early Hindu or Vedic.*—At least a thousand years B.C.—probably much more, perhaps fifteen hundred—an Aryan race from central Asia descended across the Western Himalayas into northern India through the north-west corner, and gradually spread over the whole country. They were, ethnologically, of the Caucasian or Indo-Germanic type, with fair complexion, straight profile, lofty brow, compressed mouth, tall stature. But their complexion was darkened by sojourn below the Himalayas; their hardihood was softened, while their intellect was refined by the hot climate. They received the name Hindu from Hind, that quarter which they first overran. Their language, the Sanskrit, is one of the most highly elaborated forms of human speech. They brought with them the Vedic religion. They produced the sacred verse of the Vedas and the legends on which the two great epics, the Mahábhárata and the Rámáyana, were founded in a subsequent century. They formed the rules of social ethics afterwards embodied in a code known as that of Manu, or the moral laws of the Manava priests. They came originally without any divisions of caste, but afterwards their society became broken up into castes, rigidly separated from each other. The first or priestly caste, styled Brahman, was held to have a divine sanction, and was kept separate without intermixture from generation to generation. The two secular castes were those of the soldier (Kshatri) and the trader (Vaisya), including all civil pursuits. These three originally consisted of those who immigrated, but they must have been largely recruited by those whom they found in the country, especially the Dravidians. Below these was the Súdra or low caste, consisting of aborigines and miscellaneous country-folk. At the bottom of the social scale were the Pariahs, who were outside the pale of caste. The dynastic and territorial arrangements of this era are but slightly known, but there were capital cities on the Ganges near the modern Patna and on the site of Allahabad.

*The Buddhist.*—As the faith and civilisation above sketched became corrupted and overlaid by mythology, a reformer arose, afterwards known as Buddha, a man of a noble family, in the region near the modern province of Oudh. Though his memory has been shrouded by fable and mysticism, he was a real personality. He lived about 500 B.C. The simplified and purified faith as he left it to his disciples had spread largely but not entirely over India by the year 337 B.C., when the Greeks arrived. Up to this time there are no proper materials for composing history. The Sanskrit language, though preserved as a classic, had ceased to be a spoken language. It had been succeeded by a modified form known as the Pali, which was the chief of the local vernaculars called Prakrit.

By this time Jainism had arisen. It is considered by many to be cognate with Buddhism; at all events it sprang from the same school of speculative thought. It maintained a separate existence on similar if not the same principles, and spread from the western regions, where it first flourished, to other parts of the country. After Buddhism had been banished from the land, Jainism remained, and still continues an effective faith.

*The Greek.*—Alexander the Great, having invaded India from the north-west corner, penetrated only as far as the Sutlej, and subdued the basin of the Indus and its tributaries—i.e. exactly the modern provinces of the Punjab and Sind. Beyond this his influence was not felt in the main portion of the country. One of his successors, Seleucus, however, entered into relations with Chandra Gupta, a Hindu king of the eastern region, who had not yielded to Buddhism, and whose name was turned into Sandrocottus by the Greeks. For this epoch there are historic materials from Greek sources.

*The Bactro-Scythian.*—The Greek invasion was succeeded by several invasions of tribes from central Asia. The Bactrians were orientalised Greeks, planted in Balkh or Bactria by Alexander, together with central Asiatic Aryans; of these the records are scanty. The Sakas or Scythians were also Aryans from central Asia. In the absence of records, it is here that numismatics begin to play an important part. Coins have been discovered indicating lines and lives of kings, and dynasties which would otherwise be unknown. These tribes penetrated as far as the central parts of the country, and held their position for some centuries after the Christian era.

*The Later Buddhist.*—Meanwhile Buddhism had produced some great rulers. In the direct line from the Chandra Gupta already mentioned, there arose As'oka, himself a convert to Buddhism, and the greatest sovereign that ever propagated that faith. He established something approaching to an empire about 230 B.C., his original kingdom being in the lower valley of the Ganges. His general edicts have been preserved. He held several councils, the last of which settled the rule of faith for observance during subsequent centuries. For this era stone inscriptions come into use. Then followed the Bactrian and Scythian invasions already mentioned; but the invaders embraced Buddhism. Thus in a certain sense the several tribes of Aryan invaders became amalgamated, and for some centuries after Christ Buddhism in faith and in civil government prevailed over India. Meanwhile it had spread to neighbouring regions, Ceylon, Burma, Tibet, China, and even Afghanistan. From the visits of Chinese pilgrims recorded on two occasions, separated by considerable intervals of time, much is learned of the then condition of the country. But while the faith endured in those regions, it yielded to the old Hinduism, which should now be called Brahmanism. Before it fell Buddhism raised many architectural monuments in various provinces, which still attest its greatness and culture. Simplicity and purity of faith were its original characteristics, and were probably maintained throughout its Indian career, however much it may have become overlaid by superstition elsewhere. At its best it was probably better than any of the native systems that have succeeded it.

*The Brahmanic or Modern Hindu.*—The subjugation or suppression of Buddhism may be dated from the time of the Brahmanist king Vikramaditya or Vikramajit, in the 6th century A.D. He overcame the Sakas or Scythians, who it is to be remembered had mostly become Buddhists, expelling some, but amalgamating most of them in his own system. He reigned at Ujjain in the Vindhya region. He antedated, so to speak, his era, placing it back 600 years, or 56 years B.C., and this is the Samvat or modern Hindu era. Thus Brahmanism finally superseded Buddhism. Its doctrines were expounded by the reformer Sankar Acharya in the Deccan, but it soon became crusted over with fables and inventions. The time of Vikramaditya has in western phrase been termed the Renaissance of Hinduism. Certainly it was so as regards Sanskrit literature. This language, long dead for all matters save religion, was revived for the drama and for descriptive poetry. Kalidasa, of this epoch, is among the sweet singers of the olden time. There were searchings and efforts after knowledge in astronomy, medicine, and other sciences. The caste system may have lost its religious efficacy for some centuries, but it retained its secular vitality. The Brahman caste had held its own. The other castes had absorbed most of the immigrants from central Asia. Then for full four centuries the Brahmanic system was re-established all over the country. It was upheld by Hindu states at Avantipur in Cashmere, at Ajodhya in Oudh, on the coast of Orissa, at Kanouj and Benares on the Ganges, at Delhi on the Jumna, at Surat on the west coast, at Vijayanagar in the southern Deccan, and elsewhere. It produced many splendid fanes, the ruins of which delight the modern observer. It was characterised by a fantastic mythology and a somewhat sensuous idolatry. It produced, in addition to the old code of Manu, a further set of regulations under the name of Yajnavalkya. Minute ceremonial observance, varying for every class, cramped the soul. Thus the spirit of the people was enslaved, their sentiments were cramped, and their thoughts awestruck. Their
mind was turned to superstitious requiremen
*rather than to the practical* questions of p
life. Their society was further enfeeble
the subjection of women. Maternal and
influence must have existed, but in an irr
way. Each one of the countless secti
community, each tribe or class, eac
descending from a common ance
narrow circle became tenacious
tions, guarding them against
caring little for anything c
arose the system of village
was consolidated and harde
troubles of the time. Ea
brotherhood within its villa
like that of a square of infa
saved Hindu society during
11th and succeeding centuri
constituted was manifestly
ern invaders. During the
there were apparently som
among the Hindus themselves
came the Mohammedan invas
the history of the country re
in the English language at
approach to it is Lassen's *Indisch*
(4 vols. 1844-61; 2d ed. 1866 *et seq.*

*The Mohammedan.*—In 1001 Mahmu
invaded India through the passes of t
Mountains. From this time onwards th
India can be fully understood from
materials, though the details are intricate.
Mohammedan dynasties in succession esta
themselves at Delhi, others at Mandu in
Vindhyas, at Ahmedabad on the west coa
five places in the Deccan, of which the two
famous are Golconda and Bijapur. At all
points architectural remains bear witness to cu
and power. Thus almost all India fell
Mohammedan dominion. About the year 120
Mongol Genghis Khan devastated the n
western part of the country. Succeeding M
invasions were repelled by the Indian Moha

dans, but in 1397 the Tartar Timur or Tamerlane advanced to Delhi and proclaimed himself emperor of India. This title lapsed for a while, till in 1525 his descendant Baber revived it, and became the first who bore the famous title of the Great Mogul. His descendants subdued one by one most of the Mohammedan states in the upper half of India, and became emperors in reality; but the states in the southern half preserved independence more or less. Baber's grandson, Akbar the Great, made this empire effective with the aid of a Hindu minister, Todur Mul. He was perhaps the greatest sovereign that India has ever seen. His code of regulations, the Ayin-i-Akberi, is still studied. His reign and the reigns of his three successors were splendid, and their architectural remains evince an artistic culture hardly surpassed in any age or country. Of these three the last was Aurungzebe, a man of masterful ability, disfigured by a cruel bigotry. In his time the empire began to shake, and a new Hindu power was set up—the Mahrattas. After his death in 1707, the decline and fall of the Mogul empire set in rapidly. In the general cataclysm which followed four fresh Mohammedan kingdoms rose to the surface—viz. that of the Nawab Wazir of Oudh, that of the Nizam of Hyderabad in the Deccan, that of the Nawab of the Carnatic, that of Hyder Ali and Tippoo at Seringapatam in Mysore. All four are much heard of in the 18th century. After the fall of the empire the titular Great Mogul remained at Delhi till 1857. The Mohammedan system inculcated simplicity of faith and morals. It was bitterly opposed to idolatry, and was at first iconoclastic, but in the end it extended toleration to Hinduism. It fairly respected the landed property and endowments of religion. It introduced some fresh ideas, and d some breadth of ideas generally, and some notions of statesmanship and organisa- herwise it produced but little effect upon sation. It imposed its own official its own criminal law; but it main- and customs for the most part. blic instruction save that which anted Moslems all about the onvert the indigenous people where except in one quarter. eastern Bengal, where the e Moslem faith; but how uestion not settled. It hat Buddhism survived l that the inhabitants adopt Mohammedanism, Be this as it may, the ation has multiplied till it millions, and is the largest now existing in any one Mohammedan power endured uited from trans-Himalayan dy north: it soon lost its pporters came to dwell from ration in the hot country below

*al.*—The rising of the Mahrattas ohammedan domination was begun Sivaji in the Western Ghâts. Their advanced as that of the Great Mogul It was a low-caste Hindu confederation, reditary Brahmin chief at its head, under of Peshwa, at Poona in the Deccan. it absorbed the Mogul empire, it never ame the four fresh Mohammedan states above tioned; but it was the principal power existing when the Europeans appeared in force on the scene. It governed its native Deccan territories tolerably well; and to the north of them it founded several states which still endure prosperously. Still, it had less civilisation than any power since the Vedic-Aryan invasion, and it threw many parts of the country into confusion. Under its shadow some fresh evils sprung up, such as Thuggee and the organised bandit system known as Pindarry. During this hapless time occurred irruptions under the Persian Nadir Shah and the Afghan Ahmed Shah; but these invaders came, slew, sacked, devastated—and turned back again without permanently affecting the country. In the overthrow of the Mogul power that ensued, there arose a fresh system in the Punjab—viz. the Sikh. A prophet arose named Baba Nanak, who preached a reformation of Hinduism. He was followed by Govind Singh, who established the system by force of arms in the Punjab, and even as far as the Jumna. Thence arose a Sikh dynasty, which lasted till the middle of the 19th century. This essentially Hindu power cut off the Indian Mohammedans from what had been their original base in Afghanistan, and left them isolated amidst their foes.

*The Continental European.*—In the time of the Moguls and the Mahrattas several European nationalities appeared in India as travellers, traders, missionaries. The Dutch had several settlements, of which the memory still remains. The Portuguese, after the discoveries of Vasco da Gama, controlled virtually the whole west coast, excepting Bombay, then a small place. Their headquarters were at Goa, on the coast south of Bombay, which became a town and a harbour of the first rank in the 18th century. The Portuguese influence affected civilisation in the western region to a perceptible degree. In the 18th century the position of the French rivalled that of the English; the wars between the two nations were carried into the East, and the contest was waged on the waters as well as on the land of India. The name of the great Frenchman Dupleix is respected by the British in India as of the worthiest of foemen. Thus the British had to contend simultaneously with French rivals as well as native enemies on Indian soil.

*The British.*—This begins to be a dominating influence from the battle of Plassey in 1757, won by Clive over the Mogul, which gave to England the dominion of Bengal and Behar, the most populous provinces in the whole country. The British East India Company had been settled in India since 1653. It had three trading-settlements on or near the coast at Calcutta, Madras, and Bombay. These grew into establishments for fighting and governing, and the territorial nucleus thus formed soon expanded. The acquisition of Bengal with Behar raised the company's territories into a dominion of magnitude. Thus the company in the later half of the eighteenth century appeared as one of the powers. It really rose on the ruins of the Mahratta dominion. Within sixty years from Plassey, that is by 1818, when Poona, under the last of the Peshwas, fell to the British, the East India Company was the master of India as far as the Indus basin, but not in the Punjab nor in Sind. Within these limits it had acquired the whole basin of the Ganges and the coast districts on both sides of the peninsula. The Great Mogul, now powerless, was under its care at Delhi. It had conquered the Mohammedan state in Mysore and restored a Hindu sovereign there. The two Mohammedan states of Oudh and Hyderabad (Deccan) were its dependent allies, though with all honour. It was maintaining many native states, Hindu and Mahratta, in the same position. Among these must be included (after severe fighting) Nepál, the one Himalayan state which was capable of waging war, and which had contended sturdily with British forces. The Pindarries, who raised a robber-organisation almost to the rank of a power, had been subdued. The British dominion had been founded by Clive, preserved during a world-wide crisis for England by Warren Hastings, extended by Cornwallis, and still further advanced by Wellesley, and almost perfected by the Marquis of Hastings. By 1828 there was a Pax Britannica throughout India after centuries of internal war and revolution. How far the East India Company was the aggressor in any of these transactions may be a controversial question. It was often induced to participate in the contests of the native states among themselves; in self-defence it had to fight the combinations formed against its very existence; and being the victor, it had to deal with the vanquished. Thus by various means the fabric of its dominion rose. It had raised a large native army and some European forces of its own, but these had to be sustained by royal troops from England; consequently on each renewal of its charter the company passed more and more under the control of the British government. The next imperial step was in 1825, when the first Burmese war occurred under Amherst; it ended in some acquisition of territory, which was the beginning of a new dominion across the waters of the Bay of Bengal. There was then a development of peaceful civilisation under Lord William Bentinck till 1835. But in 1838 it was decided to set up a native sovereign in Afghanistan under British protection, as a means of guarding the north-western frontier. This led to the first Afghan war, after which the British evacuated that country. This was the first check in a victorious career of eighty years since Plassey. There remained the basin of the Indus yet unconquered—i.e. Sind and the Punjab; the former was conquered under Ellenborough, the latter under Hardinge and Dalhousie after severe fighting in two wars, in which the Sikhs were the aggressors. Thus the Sikh kingdom so ably founded by Ranjit Singh succumbed. Then at length it was said that not a shot could be fired in anger throughout India without leave of the British government. Under Dalhousie also a second war broke out with the Burmese; the result extended British dominion over the delta of the Irawadi. At this time all the works of peace, moral and material, were prosecuted. Shortly after Dalhousie had handed over his charge to Canning the mutiny in the Bengal native army broke out in 1857.

A crisis arose of which the dimensions can readily be gauged by the reader who has followed the various facts already set forth in this article. After the occurrence of some isolated mutinies in the Bengal native soldiery, generally called sepoys, during the early part of 1857, the native portion of the garrison at Meerut, near Delhi, broke out on 10th May; the European garrison failed to prevent them, and the mutineers marched straightway to Delhi, and were joined by the native troops there and by the city mob. The rebels set up as emperor the titular Great Mogul, who dwelt in the ancestral palace there under British protection, and proclaimed the restoration of the Mogul empire. This event was rapidly followed by the revolt of almost the whole native army of the Bengal Presidency. Their comrades of the Bombay Presidency were but slightly affected, and those of Madras hardly at all. At that time the native forces numbered more than 247,000 men of all arms; of these about 50,000 belonged to Madras, 30,000 to Bombay, and the remainder to Bengal; among the latter, however, were many troops called irregular. A large part of the irregular troops remained staunch; but of the Bengal regular troops only seven battalions continued in service. From 80,000 to 90,000 soldiers, horse and foot, were in revolt, having in many cases murdered their officers, and sometimes the European families also. The mutineers, too, who were cantoned over many stations in broad provinces, held forts, arsenals, treasuries. They were armed with British weapons, had been organised with British discipline, were in possession of much artillery, of a great number of cavalry horses and other transport, and of vast sums of treasure. In Hindustan, in Oudh, and in parts of Malwa, throughout the summer the British power was insulated at certain points, such as the camp before Delhi, the cantonment at Meerut, the fortresses at Agra and Allahabad, the weak fortifications at Lucknow. Elsewhere the European magistracy with their families had been either killed or hunted away, and the court-houses with their records burnt. The disaster extended over at least an area of 100,000 sq. m., with a population of 40 millions. It occurred, too, at the worst season of the year. If not speedily stamped out the fire must spread over the whole country. The year was a centenary of historic events. It was just one hundred years since Clive founded British dominion at Plassey, and two hundred since Sivaji the Mahratta struck a deadly blow at the Moslem power. Many an enemy thought that the knell of the empire had sounded. And certainly, unless the resources of the British Isles could be brought to bear upon the scene of revolt within a few months, the British authority would be narrowed to its three original seats—namely, the presidency towns resting on the sea-board.

At that time there were 40,000 European troops in the country. Several thousand men on their way from England to China at Lord Elgin's disposal were, with his co-operation, diverted to India. Some 40,000 European soldiers were despatched from England round the Cape of Good Hope by a sea-voyage of 12,000 miles. Meanwhile the disasters at Cawnpore and elsewhere in Hindustan had been partially retrieved by Henry Havelock.
At the outset a force, largely consisting
Europeans, marched against Delhi. After a
siege of four months, the place was recapt
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tained continuous
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Many causes
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some of the Benga
provocation. The
the ranks; they
brains to contriv
The Kabul disast

bility. Certain chiefs near the scene of the outbreak were labouring under a sense of wrong, real or supposed. Some native states had been alarmed at British policy with regard to the right of adoption. The annexation of Oudh, however righteous in itself, had induced many Mohammedan conspirators to excite mutiny, and to turn it to political account. This brought about a very unusual combination between Mohammedans and Hindus. Still, these and other lesser causes would never by themselves have brought about such a crisis as that which has been described. The prime, the fundamental cause was a large and simple fact, namely this. The native forces were much too large relatively to the European. There was only one European soldier to six native soldiers, whereas now there is one to two. The sepoys then had the physical force in their hands, and they knew it. The distribution, too, of these excessive numbers aggravated the peril. The sepoys were, as already seen, in charge of the stations containing the state resources, civil as well as military. It was the sense of power which gave them the mind to revolt. Their interests, including employment, pay, pension, and the like, were indeed bound up with the British rule. The government was over-slow to believe that the men would revolt to the destruction of their own prospects. But their conduct proves that there are moments when religious fanaticism, national sentiment, pride, and passion will prevail over self-interest. The occurrence was only a question of time, and many will wonder why it did not happen before. But an analysis of historic circumstances would show that never before had a complete opportunity offered. Mutiny of particular bodies
troops had often occurred already, and had been
ome. Thus the British authorities came to be
ly alive to the symptoms which por-
events of 1857. But after the storm had
evinced qualities rarely surpassed in the
ation, and the history of the time is
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was reorganised so as to
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rmer times, the European
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one-third. Thus, as already
and the natives were as one to
ne European was placed in charge
and dominant position, so that
wer was now in his hands. The
consolidated by the work of
successive viceroys, Elgin, Lawrence,
thbrook, with material improvement
al progress. In 1878, under Lytton, a
Afghan war was waged, which led to the
thening of the north-western frontier. The
rk of peace was continued under Ripon till 1884,
when, under Dufferin, it became necessary to proceed against the king of Ava, and subsequently to annex Upper Burma. This measure, following previous annexations, brought the whole Burmese dominion and the entire region of the Irawadi within the Indian empire in contact with south-western China. The British civilisation, by scientific legislation, by peace and order, by the recognition of property in land, by education in the widest sense, by works of material improvement, by the introduction of western ideas, is fast affecting the mind of nearly all the nationalities now existing in the empire.

*Books of Reference.*—There is not space here for attempting a review of Anglo-Indian literature, which is very extensive. Some few works only will now be mentioned, which are of a comparatively popular character and are readily accessible. For history, the best-known works are those by Mill and Thornton, and the shorter one by Marshman. Regarding special periods, Mountstuart Elphinstone, for the Mogul era; Keene, for the decline and fall of the Mogul empire; Grant-Duff, for the Mahrattas; Malleson, for the French in India; Kaye, for the first Afghan war; Kaye and Malleson, for the war of the mutinies in 1857-58; Trotter and Maine, for the Victorian era. Much light is derivable from the biographies of Clive, Warren Hastings, Metcalfe, Macaulay, the Lawrences (Henry and John), Mayo, and Dalhousie. The reports by the government on the moral and material progress of the country, and the volume of statistics published annually by the Indian Office in London, afford the best current information. Similarly the *Imperial Gazetteer of India* (2d ed. 14 vols. 1885-87), edited by Sir William Hunter, and his *Indian Empire*, in one volume, are most useful. *Modern India*, by Campbell, *Modern India and the Indians*, by Monier Williams (1889), *India Past and Present*, by Samuelson (1889), and *India in 1880*, by Temple, represent the country as it was under the East India Company in the middle of this century, and as it is under the crown towards the century's close. To these may be added Markham's account of the surveys, the Archæological Survey, and the Geological Manual. For the military defensibility of the north-west frontier against possible Russian designs on India, reference may be made to Curzon's *Russia in Central Asia* (1889), and to Sir Charles Dilke's *Problems of Greater Britain* (1890).

These, and many similar works that might be cited, present the aspect of the empire from a European point of view. As already stated in this article, the history of ancient India in its purely native condition remains to be written, in English at least. The *Journal of the Royal Asiatic Society* and the *Calcutta Review*, however, supply quite a mine of materials. Some light is thrown on this great subject by Tod's *Rajasthan*, Rajendralal Mitra's *Antiquities of Orissa*, Rhys Davids on Buddhism, Framji on the Parsees, Talboys Wheeler's *Mahábhárata* and *Rámáyana*, abstracted in English; Max Müller's analysis of oriental religions; the translations of the sacred books of the East; Barth's *Religions of India* (Eng. trans. 1882); Monier Williams' *Indian Wisdom*, and his *Brahmanism, Buddhism, and Hinduism* (1889); Lyall's *Asiatic Studies* (2d ed. 1884), Edward Thomas' Numismatic Essays, and Fergusson's *History of Indian Architecture*. Indian architecture is illustrated at the articles on AGRA, BENARES, ELEPHANTA, ELLORA, &c. And see amongst others the following articles in this work:

Afghanistan.
Akbar.
Aurungzebe.
Bengal.
Bombay.
Brahma.
Buddhism.
Calcutta.
Canning.
Caste.
Ceylon.
Clive.
Dalhousie.
Dupleix.
East India Company.
Ganges.
Hastings.
Himalaya.
Indus.
Jains.
Juggernaut.
Madras.
Mahrattas.
Mohammedanism.
Sanskrit.
Sikhs.
Siva.
Suez Canal.
Suttee.
Vedas.
Vishnu.
Wellesley.

**India,** STAR OF. See INDIAN ORDERS.

**Indiana,** the thirty-first state of the American Union in area, and the sixth in population, is centrally situated between 37° 47′ and 41° 50′ N. lat., and in 84° 49′—88° 2′ W. long. It is bounded on the N. by Lake Michigan and Michigan state, on the E. by Ohio, on the S. by Kentucky, from which it is separated by the Ohio River, and on the W. by Illinois, the Wabash River being the line

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of division a part of the way. Its greatest length north and south is 276 miles, its average breadth 140 miles, and its area 36,350 sq. m. The coast-line on Lake Michigan is about 60 miles.

The surface of the country has a slight slope towards the west and south-west, the highest point, near the eastern boundary, being 1250 feet above sea-level. Drainage is in four main directions: through the St Joseph River to Lake Michigan, the Maumee River to Lake Erie, the Kankakee River to the Mississippi, and the Wabash and other streams to the Ohio; small streams intersect the state in every direction, and in the northern part there are numerous small lakes. The northern half of the state is generally level, except for occasional irregular ridges forming 'divides' between streams. Hills increase in frequency from the centre of the state to the south and south-east, and along the Ohio 'knobs' 200–500 feet high are almost continuous, with deep gorges and river-bottoms between. Much of the north-western regions is inundated with water the greater part of every year; but this land is being actively reclaimed by a system of drainage. The fertility of the soil, whether clay or sandy loam, is greatly increased by a vast system of under-draining, there being in 1888 nearly 25,000,000 yards of drain-tiles in use.

The minerals include coal, bog and hematite iron ores, and stratified limestones and sandstones in abundance, ochre beds, kaolin, fireclays, and some gold. The actual workable coalfield covers an area of 6000 sq. m. The production of coal of all kinds amounted in 1870 to 437,870 tons, in 1880 to 1,449,496 tons, and in 1888 to 3,140,979 tons, mostly block coal, although there is also abundance of bituminous and some cannel coal. The natural-gas field, the centre of which is in Delaware county, 40 miles NE. of Indianapolis, has been developed since 1886, and $6,000,000 was invested in 1888 in the business of supplying it for fuel, there being 395 wells *in twenty-three counties. In 1889 there were 500 wells in twenty-eight counties, with an average* flow for each of 1,750,000 cubic feet daily. In the gas region, and in the districts within reach of its pipes, it has become almost the exclusive fuel, and is also coming into use as an illuminant; its cost is from one-half to two-thirds less than that of coal. The houses, public buildings, and factories of Indianapolis are almost all heated with it.

The principal industry of Indiana is agriculture. In 1888 more than 10,000,000 acres were cultivated, and the chief crops were: wheat, 28,750,764 bushels; maize, 128,430,284 bushels; oats, 27,493,851 bushels; barley, 403,615 bushels; rye, 545,425 bushels; flax-seed, 101,693 bushels; hay, 2,860,338 tons; potatoes, 5,480,960 bushels; sweet potatoes, 234,832 bushels; tobacco, 16,403,540 lb. The total crops were valued at $118,888,792. The number of horses was 585,707; mules, 60,185; cattle, 1,360,399; sheep, 1,266,109; hogs, 3,733,762. The dairy products were valued at $21,335,707, pork, &c. at $20,572,100, beef at $10,823,850, and poultry at $3,000,000. Other products were wool, 3,634,159 lb.; honey, 923,922 lb.; maple-sugar, 116,103 lb.; sorghum-sugar, 39,728 lb.; sorghum-syrup, 919,118 gallons; canned fruits and vegetables, 2,498,920 lb.; cider, wine, and vinegar, 3,766,975 gallons.

The manufactures of Indiana present great variety, and are often important. Among the largest manufactories of their class in the world are the wagon and plough factories at South Bend, the manufactories of flour-mill machinery and carriages at Indianapolis, the plate-glass works at New Albany, and the encaustic tile works at Indianapolis. Indianapolis has also the second largest pork-packing establishment, and is at the head of the sofa-manufacture; Indiana, indeed, turns out more furniture than any other state of the Union, largely made from the valuable timbers of the Wabash and its tributaries. In 1886 there were 11,885 manufactories, with a capital of $51,490,656. The value of raw material used during the year was $91,872,291; of products, $158,562,729; wages and other expenses, $31,211,152. These figures show no advance on those of 1880; but there has since been a great increase both in the number of manufactories and in the value of their products, especially in the natural-gas region, where nearly 150 new works were started in 1886–90, the majority large manufactories of glass and iron. The central position of Indiana compels all main through-lines from the east and west to cross the state. The first railway, 86 miles long, was completed from Madison to Indianapolis in 1847. In 1880 there were 4020 miles of railway in operation; in 1888, 5745. The Wabash and Erie Canal, the largest in the United States (476 miles), has 374 miles in Indiana; and another canal (75 miles) extends from Lawrenceburg to Hayestown. The Ohio is navigable throughout its length, and on it over fifty Indiana steamboats ply; the Wabash is navigable to Lafayette, and its branch, the White River, for about 60 miles.

The population in 1800 numbered 4577 whites and 163 coloured, 135 of the latter being slaves. In 1860 the population was 1,350,428; in 1880, 1,978,301; in 1888 (estimated), 2,600,000. The cities with over 20,000 of a population in 1880 were Indianapolis (75,056), Evansville (29,280), Fort Wayne (26,880), and Terre Haute (26,042). Great attention is devoted to education. In 1888 the children of school age numbered 756,989, of whom 514,463 were enrolled in the common schools. The number of teachers was 14,204, of school-
houses 9882; the revenue for the year w
$5,235,032. There are a state university at B
ington, the Purdue University and state in
of technology at Lafayette, and the state
school at Terre Haute, as well as a hun
schools: *instruction at all these is free.*
state control are 14 universities an
numerous academies and speci
of the colleges, as in the comm
are educated together.

The state is divided into n
The governor is elected for four
assembly, composed of fif
hundred representatives, m
Indiana has two senators a
tives in congress. The ju
court, five in number, are el

*History.*—Indiana was disc
1671, and constituted part o
1763 France ceded the country t
the treaty of 1783 it became t
States, under the general terr
territory, which later was divid
tories of Ohio, Indiana, Michiga
Illinois. In 1816 Indiana was adm
Union, and the state government
settled at Indianapolis in 1825. By the
of 1787 slavery was prohibited in the
The Indian troubles resulting from the in.
settlers culminated in the battle of Tippecano
HARRISON, W. H.) in 1811. Indiana supplied
regiments for the war with Mexico, and during th
civil war furnished for the government service
208,367 men, of whom 24,416 were killed or died
of disease.

**Indianap'olis,** the capital and largest city of Indiana, is on the west fork of White River, on a level plain, near the centre of the state, 195 miles SSE. of Chicago by rail. It is a regularly-built and beautiful city. Its streets, many of them 100 feet wide, for the most part cross at right angles; but four main avenues, radiating from a central park, cross the others diagonally. The principal buildings include a handsome new state-house (completed 1888), a fine county court-house, a city hall, a prison for women, a large state asylum for the insane, and other asylums for the blind and deaf and dumb; and the city possesses an imposing monument to the soldiers and sailors who fell in the civil war. It has also two medical colleges, numerous schools, and nearly a hundred churches. Indianapolis is one of the chief railway centres of the United States, fifteen main lines converging here. The trade in agricultural produce is very considerable. Pork-packing is the leading industry, but there are also large flour and cotton and woollen mills, numerous foundries, and manufactories of furniture, carriages, tiles, &c. (see INDIANA). The site of Indianapolis, then covered with dense forest, was selected for the future capital in 1820, and the city was founded in 1821. In 1860 the pop. was 18,113; (1870) 48,244; (1880) 75,056; (1888, estimated) 130,000.

**Indian Army.** See EAST INDIA ARMY.

**Indian Corn.** See MAIZE.

**Indian Cress.** See NASTURTIUM.

**Indian Fig.** See BANYAN, PRICKLY PEAR.

**Indian Fire,** a bright white signal-light, produced by burning a mixture of 7 parts of sulphur, 2 of Realgar (q.v.), and 24 of nitre.

**Indian Ink.** See INK.

**Indian Ocean.** The Indian Ocean is bounded on the W. by Africa, on the N. by Asia, on the E. by Australia and the Australasian Islands. According to modern geographers it is limited to
S. by the 40th parallel of south latitude, in
region it opens widely into the Southern and
oceans. It gradually narrows towards
and is divided by the Indian peninsula
ay of Bengal on the east and the
on the west, the latter sending
arms, the Persian Gulf and the
se limits the Indian Ocean
area of 17,320,500 sq. m.
ry the Indian Ocean was
n Sea; the Phœnicians are
niliar with this southern
ate. Necho, an Egyptian
bout 610 B.C., is reported
ent some of his vessels,
nto the Erythraean Sea
the south of Africa and
Whether or not this
it appears certain, from
ition of the sun to the
se early navigators pene-
GRAPHY, Vol. V. p. 145).
e there was a coasting
d the Persian Gulf, but
hus, one of Alexander's
ndus to the Persian Gulf,
ole record of these coasts.
an navigator who flourished
of the Christian era, was the
e regular alternations in the
onsoons of the Indian Ocean, and
to open up a direct route across
om the Red Sea to India. The
ere henceforth abandoned, and a
was given to voyages into oriental
he 9th century the Arabs made fre-
voyages across the Indian Ocean, Soleiman
af being probably the first to cross the Bay of
al and pass into the China Sea. In 1486 the
uguese rounded the Cape of Good Hope, and
1498 Vasco da Gama reached the coasts of India
by the same route. In 1521 the one remaining ship
of Magellan's squadron crossed the southern Indian Ocean in completing the first circumnavigation of the world.

The mean depth of the Indian Ocean is estimated at about 2300 fathoms, or slightly greater than that of the Atlantic (q.v.). The greatest depths are in the eastern part to the south of the equator, where it is estimated that there are fully 50,000 sq. m. with a depth of over 3000 fathoms. Over 13,000,000 sq. m. of this ocean's floor lie between the depths of 2000 and 3000 fathoms.

The area of land draining into the Indian Ocean is estimated at 6,813,600 sq. m., and the annual rainfall on this land is equal to 4379 cubic miles of water. The rivers flowing from the Asiatic continent are by far the most important, and they carry an immense amount of detrital matter into the Bay of Bengal and Arabian Sea, these forming extensive deposits of blue mud. Along the African coasts, in depths from 100 to 1000 fathoms, there are great deposits of glauconitic sands and muds, and on these as well as other coasts there are coral muds and sands, and blue and green muds in the shallower depths. In the deeper parts of the ocean, far from land, there are vast deposits of red clay, Radiolarian ooze, and Globigerina ooze. In the Southern Ocean, towards the Antarctic, the bed of the ocean is covered with a Diatom ooze.

The temperature of the surface waters of the Indian Ocean varies much in different parts of the ocean, and at the same place at different times of the year or states of the wind. In tropical regions the temperature usually varies from 70° to 80° F., and the yearly range is only 7° or 8° F. Off the Cape of Good Hope and off Cape Guardafui, however, the annual range of temperature may be from 20° to 30° F. For instance, sudden and great changes of temperature are often noticed off Cape Guardafui when the wind blows off shore, for in this way cold and deep water is drawn up along the African coast to take the place of the warm surface water which is driven eastward by the wind.

The temperature of the water at the bottom of the Indian Ocean is very uniform and subject to little, if any, annual variation. In the Bay of Bengal and Arabian Sea temperatures of 33°·7 F. and 34°·2 F. have been recorded at the bottom; these are not more than the fraction of a degree higher than those observed by the *Challenger* in 50° of south latitude. It is certain, therefore, that this deep cold water is slowly drawn into the Indian Ocean from the Antarctic to supply the place of the warm surface currents that are driven southward by the winds. The currents of the Indian Ocean are less constant than in the other great oceans, and are largely controlled by the direction and strength of the monsoons (see MONSOONS). Some of the most characteristic coral atolls and islands are to be found towards the central part of the Indian Ocean, such as the great Maldive group, the Chagos, Diego Garcia, and the Coccos Islands. Almost all the tropical shores are skirted by fringing and barrier reefs. Christmas Island is an upraised coral formation. St Paul's, Mauritius, Rodriguez, and others are of volcanic origin, while Madagascar, Ceylon, and Socotra are typical continental islands.

**Indian Orders.** Three British orders of knighthood take their name from India. (1) The Imperial Order of the Crown of India, instituted 1st January 1878, consists of the Queen, certain of her daughters and daughters-in-law, of numerous native Indian princesses, and the wives and other female relatives of the viceroy of India, the governors of Madras and Bombay, and the Principal Secretary of State for India. (2) The Most Exalted Order of the Star of India, instituted in 1861, and enlarged in 1866 and 1878, consists of the sovereign, a grand-master (the viceroy for the time being), and three classes of members—Knights Grand Commanders (G.C.S.I.), of whom there may be 30; Knights Commanders (K.C.S.I.), of whom there may be 72; and Companions (C.S.I.), 144 in number. The badge of the order is a light blue ribbon with thin white stripes, and the motto 'Heaven's Light our Guide.' (3) The Most Eminent Order of the Indian Empire, instituted in 1878 to commemorate the proclamation of the Queen of England as Empress of India, and enlarged in 1886 and 1887, consists of the sovereign, a grand-master (the viceroy for the time being), and three classes of members—Knights Grand Commanders (G.C.I.E.), Knights Commanders (K.C.I.E.), and Companions (C.I.E.). The motto of the order is *Imperatricis Auspiciis* ('Under the favour of the Empress').

**Indian Red,** a silicate of iron, imported from the Persian Gulf.

**Indians,** Red. See American Indians.

**Indian Shot** (*Canna indica*), a plant common in almost all tropical countries; a herbaceous perennial, with a creeping root-stock (*rhizome*), and a simple stem, formed by the cohering bases of the large, tough, ovate-oblong leaves. It belongs to the natural order Marantaceæ. It derives the name Indian Shot from the seed, which is hard, round, and about the size of a very small pea. The seed yields a beautiful red colour. The root-stocks are very large, spongy, and jointed, and are used in Brazil for emollient poultices in tumours and abscesses. The root-stocks of some of the other species of Canna are more valuable, yielding the starch called Tous-les-mois.

**Indian Territory** is a name somewhat loosely applied to an area of about 70,000 sq. m. situated between the 37th parallel on the N., the Red River on the S., and the meridians 94° 20′ and 100° E. and W. Until quite recently it embraced a narrow strip of public land popularly known as 'No-Man's-Land.' The north-western part, in all about one-fifth of the area of the territory, is commonly known as the Cherokee Outlet. This tract has recently been thrown open to settlement, but as late as 1890 most of the lands had not become available for entry, their purchase from the Cherokees not having been officially consummated. The south-eastern part of this tract, however, now constitutes the territory of Oklahoma. The title to that part lying between the forks of the Red River is also unsettled, being claimed both by Texas and the Federal government.

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The surface of the territory slopes from the foot-hills of the Rocky Mountains towards the south-east. The land is generally undulating, and is diversified by low ranges of hills—Wichita, Sans Bois, Arbuckle, and Shawnee being the most conspicuous. The Arkansas and Red (or Roxo) rivers drain their entire territory. The main tributaries of the former are Cimarron, Canadian, Verdigris, and Neosho; of the latter, North or Prairie-dog-town Fork, and Washita (or Ouachita). The bottom-lands of the central and eastern parts are wonderfully fertile; the western part, because of its aridity, is less productive.

The vegetation of the eastern part is varied. The bottom-lands are well wooded, and a belt of forest, known as the 'Cross-timbers,' stretches from the Arkansas to the Brazos River of Texas. The western part is treeless, and is covered mainly with cactus, yucca, and sage-brush. Wild grasses are abundant, and the 'bunch-grass' of the treeless regions affords food to vast herds of cattle. Black walnut, persimmon, and sugar-maple are noteworthy among the forest trees of the bottom-lands. The black bear, brown bear, antelope, and deer are the most important wild animals. Wild turkeys are numerous. The mineral resources are undeveloped and practically unknown. Much of the surface, however, is underlaid by coal-measures of the Carboniferous period. The climate is not marked by great extremes. The rainfall varies from 20 inches in the west to 52 in the east.

Indian Territory, formerly more than double its present size, was set apart in 1832 as a home for the Indian tribes east of the Mississippi. Of the twenty or more tribes now occupying it the Choctaws, Cherokees, Creeks, Chickasaws, Cheyennes, Arapahoes, Kiowas, Comanches, and Osages own three-fourths of the area. Of the various tribes the Cherokees and Choctaws are the richest and perhaps the most civilised. Each supports an organised government, and maintains schools, churches, banks, and other similar institutions. Several newspapers are published, one of which is in Choctaw and English, and another in Cherokee and English. The Delawares, Seminoles, and Quapaws, the last under the auspices of the Society of Friends, have also reached a high state of civilisation.

The entire population is estimated at 150,000, and includes a rapidly-increasing number of whites, together with several thousand negroes. The industries are mainly grain-farming and stock-raising. A line of railway crosses the Cherokee and Choctaw Nations, but railway-building is not encouraged either by the Indians or by the United States government. Tahlequah is the capital of the Cherokee nation, and the largest towns in the territory are Krebs, Lehigh, and McAlester (Choctaw), Ardmore, and Purcell (Chickasaw), and Mus-co-gee (Creek).

*Oklahoma Territory* was founded in 1889, but its
territorial organisation was not completed
about a year later. It is in the heart of I
Territory, and embraces about 3000 sq. m
Cherokee Outlet. It is situated mainly
parallels 35° and 36° 10′, and between
97° 15′ and 98°. Generally the soil is
and extremely fertile. Guthri
floating population of about 10
City are the chief business cent

*No-Man's-Land* is a narrow
which was a part of Texas w
republic. In order that Texa
as a slave-state, all that par
of 36° 30′ was ceded to the
erroneously supposed that t
among lands transferred to t
Kansas and New Mexico w
therefore left unincluded wi
ritory. Beaver City is the ch
tion.

**India-rubber,** Caoutchou
tic, a substance which, on accou
properties, is extensively used in
found in the milky juices of plants, ar
antly in the natural orders Moraceæ, Art
Euphorbiaceæ, Apocynaceæ, and Ascle
It exists in the milky juice of plants gi
temperate climates; but it is only in tropic
subtropical countries that it occurs so abund
as to be of economical importance. The princi
South American tree is the *Hevea brasiliensis* or *guianensis*, also called *Siphonia elastica*, or *Jatropha elastica*, a Euphorbiaceous tree; also the Mexican *Castilloa elastica*, which is Artocarpaceous. In the East the *Ficus elastica* (of the order Moraceæ), akin to the Banyan (q.v.), is a tree of noble proportions, the appearance of whose glossy leaves is well known in Europe from small specimens grown in pots as ornamental plants. Various Apocynaceous trees (Willughbeia, Landolphia, Urceola,

&c.) yield commercial quantities of rubber in Malaya, Borneo, and Central Africa. The name *Caoutchouc* is from a Carib or Central American word *Cachuchu.*

Some of the properties of india-rubber must have been known in America at a very early period, because balls made by the Haytians of the *gum of a tree*, bouncing better than the wind-balls of Castile, are mentioned by Herrera in his account of Columbus's second voyage. In a book published in 1615 Juan de Torquemada mentions the tree which yields it in Mexico, describes the mode of collecting the gum, and states that it is made into shoes; also that the Spaniards use it for waxing their canvas cloaks to make them resist water. More exact information was furnished by M. de la Condamine in 1735. India-rubber was at first known as *Elastic Gum*, and received its present name from the discovery (about 1770) of its use for rubbing out black-lead pencil marks, for which purpose it began to be imported into Britain in small quantities about the end of the 18th century, being much valued by artists, and sold at 3s. the cubic half inch. Even before this time its employment for the manufacture of flexible tubes for the use of surgeons and chemists had been successfully attempted; but it was not till 1820 that its employment began to extend beyond the rubbing out of pencil marks. Its application to the manufacture of waterproof cloth first gave it commercial importance. About the same time a method was discovered of fabricating articles of various kinds by casting india-rubber in moulds. Its elasticity and flexibility, its insolubility in water, and its great impenetrability to gases and fluids in general have now been found to adapt it to a great variety of uses; but for by far
eater number of its applications it is now
ed in the vulcanised state.

dia-rubber of commerce is obtained most
om South America, but considerable
are also procured from British India, the
elago, the west coast of Africa, and
ring the year 1888 the imports
Great Britain were as follows:

| | Cwt. |
|---|---|
| ........................ | 106,617 |
| a........................ | 43,443 |
| ........................ | 7,352 |
| ntral America.......... | 9,135 |
| ........................ | 21,989 |
| ........................ | 11,276 |
| ........................ | 20,238 |
| ........................ | 220,350 |

rts were only 15,269 cwt.;
1876, 157,509 cwt.; in
37, 237,511 cwt.; in 1888,
39, 236,275 cwt. In 1883
cwt. was 318s.; in 1885,
in 1889, 221s. The value
was £3,652,817, and in
exported 15,750,000 kilo-
The value of the imports of
in 1888 was £290,573, and the

ometimes collected by cutting
hich is a very ruinous process,
mainly that a greater quantity may
The more usual method, however,
simple incisions in the trunks. In a
juice which flows out fills clay basins
eive it. It is solidified and dried by
ethods—sometimes spread out in thin
and dried in the sun or the smoke of fires, sometimes (in Central America) coagulated by leaves of a kind of vine. A good tree will yield four ounces of juice daily, and twenty gallons in a season; a gallon producing 2 lb. of good rubber. Adulteration is not uncommon.

Para india-rubber is the best, and commands the highest price in the market (averaging about 3s. per lb.). The other South American kinds are of fair quality. East Indian rubber, though naturally a fine quality, is often injured by adulteration and careless collecting.

Commercial india-rubber is a tough fibrous substance, possessing elastic properties in the highest degree. Reduced to the temperature of freezing water (32° F.) it hardens, and in greater part, if not entirely, loses its elasticity, but does not become brittle. When heated, as by placing in boiling water, it softens and becomes very much more elastic than at ordinary temperatures, though it does not in any degree dissolve in the water. If suddenly stretched to seven or eight times its original length it becomes warm; and if kept in this outstretched form for several weeks it appears to lose in great part its elastic properties, and in this condition is readily cut into those thin threads which are used in the *elastic* put in bonnets, &c., and the elasticity of which is readily renewed by the application of gentle heat. Of late years, however, elastic thread is usually prepared with vulcanised rubber. Commercial india-rubber is insoluble in water and alcohol, is not acted upon by alkalies or acids, except when the latter are concentrated and heat is applied, but is soluble in ether, chloroform, bisulphide of carbon, naphtha, petroleum, benzol, and the essential oils of turpentine, lavender, and sassafras. Many other essential and fixed oils, when heated with rubber, cause it to soften, and produce thick glutinous compounds, especially linseed-oil, which, in the proportion of 1¼ lb. of the oil to 4 oz. rubber in thin strips of films, yields a solution which, when strained, is of great use in rendering shoes, cloth, &c. waterproof. When heated to 248° F. rubber fuses; and at 600° it is volatilised, at the same time undergoing decomposition, and yields a liquid called *Caoutchoucin*, possessing great solvent powers over india-rubber and other substances.

To purify the raw material it is boiled for some time in large tanks, which softens it and in some measure releases the solid impurities with which it is often mixed. It is then put through powerful machines which masticate and reduce it to shreds, and while undergoing this operation a stream of water is constantly running over it and thoroughly cleansing it from all impurities. It is then rolled out into thin sheets and hung up to dry in a room heated by artificial means, and thus freed from all moisture. Or, after cleansing, the material undergoes a process of kneading under very heavy rollers, which causes the adhesion of the various pieces of rubber to each other, and ultimately yields a mass or block of rubber in which the condensation is so perfect that all air-holes and other cells and interstices disappear. The block of rubber is then cut under water by powerful knives or shears into sheets, from which bands or thread may be obtained. In the manufacture of square threads mere cutting is had recourse to; and the delicacy of the operation may be understood when it is stated that one pound of rubber will yield 32,000 yards of thread. The round elastic thread is prepared from rubber which has been treated with about double its weight of bisulphide of carbon, containing about 5 per cent. of alcohol, which yields a soft material resembling in consistence bread-dough or putty; and this being squeezed through a series of small holes, produces minute round threads, which are first received on an endless piece of velvet, and ultimately on an endless web of common cloth 500 to 600 yards long, during the transit of the threads across which the solvent or bisulphide of carbon evaporates, and leaves the india-rubber. When it is wished to weave these threads into cloth they are wound upon bobbins, taking care to stretch the rubber as much as possible, so as to deprive it for the time being of its elasticity; and, after it has been woven into the cloth, a hot iron is passed over the fabric, and immediately the rubber resumes its elasticity.

The method for making waterproof clothing or 'Mackintoshes,' the first application of rubber on a large scale, was invented at Glasgow in 1820-23 by the Scottish chemist, Charles Macintosh (1766-1843). In this manufacture the caoutchouc has to undergo many and varied processes. It is first reduced to a solution with naphtha or other solvent, and it is then amalgamated with other ingredients according to the nature of the material it has to be applied to. It is then spread on the surface of the cloth, a process formerly done by hand, but now by means of spreading machines, which apply it in very thin coats, so thin that with pure para proofing as many as *twelve coats are spread to make* the cloth airproof, but so thin is each coat that the twelve only measure one ninety-sixth part of an inch; for ordinary waterproof purposes, however, five or six are generally sufficient. For double textures the cloths are then pressed together between heavy rollers. These cloths are all vulcanised, and this can be performed by a number of processes—by the 'cold' process, by vaporising, by steam, and by dry heat. The garments are then cut out from the cloth, and fastened together by means of pure rubber cement, which make the edges adhere.

The variety of garments now made up are almost endless, and every year the demand for them in fashionable designs and cloths is increasing.

*Vulcanised or Solid India-rubber.*—Pure india-rubber is now used only to a limited extent in the arts, but it is applied in the vulcanised state to a very large extent. The remarkable change which caoutchouc undergoes when mixed with sulphur and heated, according to circumstances, from 240° to 310° F., was discovered by Charles Goodyear, in America, in 1834-44, and independently, about the same time, by Mr Thomas Hancock, in England. In the process of vulcanising, the rubber, as a preliminary step, is either torn into shreds or crushed into thin pieces by machinery, and afterwards washed. There are two principal kinds of vulcanised rubber, one hard and horny in its texture, the other soft and elastic. In the case of the former the caoutchouc is mixed with about one-third of its weight of sulphur, and heated for several hours, the temperature finally rising to fully 300° F. For the soft kind of vulcanised rubber, on the other hand, a much smaller proportion of sulphur is required—viz. from 2½ to 10 per cent., and the heat to which it is subjected in the vulcanising chamber is considerably less. Usually, too, with this latter kind, the articles are made before the rubber is heated. The sulphur is commonly added in the ground state, but sometimes the rubber is treated with some solution containing this element, such as the bisulphide of carbon.

Although sulphur is the only essential ingredient required for vulcanising rubber, yet other substances are usually added. Thus, in the case of machinery belting, pipes, and some other articles, the silicate of magnesia (French chalk) is used to prevent adhesiveness. *Litharge*, or *carbonate of lead*, again, is frequently mixed with the rubber and sulphur for certain purposes; but there is really a long list of materials more or less used in preparing different qualities of vulcanised caoutchouc, each manufacturer using mixtures the exact nature of which he is careful not to divulge. Asphalt, tar, lime, lampblack, whiting, rosin, sulphide of antimony, and ground cork are some of the ingredients most commonly employed in this way. Belting for machinery and some kinds of tubing are formed of alternate layers of canvas and vulcanised rubber.

Natural caoutchouc, as already stated, is elastic, cohesive, impervious to gases, insoluble in water, and resists many chemical reagents; but it loses its elasticity by cold, softens by heat, and is destroyed by many fixed oils. After being vulcanised caoutchouc has its elasticity greatly increased, is not hardened by cold, and does not soften or become viscid at any temperature short of its absolute decomposition. Besides, it is barely soluble in turpentine, naphtha, and the other solvents of pure caoutchouc; nor does oil readily penetrate or soften it. Very often, however, the natural oil in some cloths, or oils used in manufacture, tend to make the rubber decay, and this has often caused rubber-manufacturers a large amount of trouble.

It would be a hopeless task to attempt to specify the *many useful purposes to which vulcanised* caoutchouc is applied, even if we had the space to spare. From the year 1843, when it was first made, to the present time the various patented applications of it must be thousands in number. The mere abridgments of the specifications connected with this material, issued by the English Patent Office, form a thick volume. Under the head GOLOSHES will be found a brief description of the process of making india-rubber shoes. Both coats and shoes of this material have, however, the objectionable property of preventing the escape of moisture from the skin. Belting, buffers, wheel tires, washers, valves, pipes, fire-hose, and other engineering appliances form a large branch of the rubber-trade. For medical and surgical purposes many articles are made of this material. Of suc
an apparently trivial matter as vulcanised ru
thread one English firm turns out about 30
per day, and another single small arti
tobacco-pouches—is made in another facto
rate of 3000 per diem.

Hard vulcanised rubber, termed
sometimes ebonite, is made into
articles, such as combs, chai
penholders, paper-knives, kni
&c., as a substitute for materi
ivory, and jet. Like these su
it is formed into various obje
ting, carving, polishing, and
numbers of these articles are
colour of vulcanite ornamen
to turn gray, but the brittle
of combs made of it a few y
overcome. With respect to c
size, vulcanite has been made
mental tiles, and even rails fo
ing for footpaths, for which latt
admirably. A kind of vulca
largely employed as an insulator

India-rubber when melted at 398°
with half its weight of slaked lime, fo
cement or lute, which can be easily loo
it will dry and harden if red lead is addec
tenacious glue is formed by heating caou
coal-tar, and shell-lac together. It forms
gredient in some special kinds of varnishes, a
also improves the lubricating qualities of mineral oils when a small quantity is dissolved in them.

*In Great Britain* some of the large india-rubber factories employ over 1000 hands, and smaller works are springing up all over the country. The exports are sent all over the world, principally to the Continent, North America, and Australia. The duty levied on this class of goods is prohibitive of the expansion of the trade with the United States. The manufacture of india-rubber is also carried on extensively in the United States and France. In most rubber-factories a large number of the work-people are females; and, as no great skill is required on the part of the operatives engaged in some departments, employment in such works has proved a boon to many persons who have never learned a trade.

The high price of raw india-rubber has led to many attempts to produce a substitute, but none of them equal in durability the pure caoutchouc.

**Indicator-diagram,** a diagram drawn on an *indicator-card* by the pencil of the *indicator* of an engine at work. The object in view is to ascertain the relations between, and also the product of the varying pressure and the corresponding variations of volume of, the working substance—steam, explosive gas mixture, hot air, or other material. The latter, the variations of volume, are, in a cylinder, well represented by the movements of the piston; the former, the varying pressure, may be followed by making the steam, &c. press out the piston of a small side-cylinder against the resistance of a spring. If a pencil be attached to this piston it will mark on a piece of paper or card held in contact with the point a straight line traced and retraced with varying velocity. If the steam be shut off from this side-cylinder the pencil assumes the position of 'no pressure.' If now, on the other hand, the piston of the main cylinder be made to draw the paper or card past the pencil point in a direction at right angles to the former, the varying velocity with which a straight line is traced and retraced on the paper will reproduce
he varying velocities of the main piston itself. If
hese two actions be now combined the pencil will
ve, say, up and down, while the paper will oscil-
r be unrolled backward and forward. The
int will accordingly describe upon the paper
larly-curved figure which will, in uniform
e a closed curve, and will always tend
ly to reproduce itself during each suc-
the engine. Upon the scales on
es of the pencil represent, in
les to one another, the varia-
ie piston-movements respec-
d by this curve will repre-
y the engine during each
ables the actual pressures
ng substance to be traced
ortion of the cycle, and
of the engine to be care-
or examples see Holmes,
igald Clerk, *Gas-engines.*
r diagrams.

or cycle of fifteen years,
nvolved in obscurity, but
scal term. It began to be
e, chiefly by ecclesiastical
life of Athanasius; it was
the popes, who still con-
through whose influence it
erally employed during the
ne dates of charters and public
a are expressed in indictions as well
he Christian era. The first indiction
have commenced on September 24,
Constantine's victory over Maxen-
ckon backwards to the commence-
the Christian *era* it will be seen that
es not correspond to the 1st, but to the
of an indiction—hence, *if to any given*
*f the Christian era* 3 *be added, and the sum*
*ded by* 15, *the remainder will give the position*
*that year in an indiction*—thus, 1890 A.D. was
liction. Of course such a
e was necessarily incom-
tatement of the number of indictions which had elapsed since the first adoption of that method of computation.

**Indictment.** See CRIMINAL LAW.

**Indies.** See EAST INDIES, and WEST INDIES.

***Indigestion,*** or DYSPEPSIA, properly includes only such derangements of the digestive process as do not depend on any recognisable structural change. But it is very common to apply the term loosely to any digestive disorder, whatever its cause may be. In this sense dyspepsia is a symptom of a multitude of diseases, in the description of which, when it is sufficiently important, it will be found noticed. Functional dyspepsia, the dyspepsia of otherwise healthy people, is what will be considered here. Of this there are two chief varieties, the *atonic* and the *irritative* or *acid* dyspepsia. The former is caused by deficient secretion of the gastric juice and diminished movement of the stomach walls, and it is often associated with a want of vitality in the system. The latter is frequently found in persons of vigorous and robust frame and of active habits; and in many cases it is to be looked upon as the result of an excess of digestive activity leading to the accumulation of an abnormal amount of acid products in the stomach, especially toward the end of digestion. This form is more common in men than in women, and is rarely met with before adult life.

The symptoms of dyspepsia differ considerably in different individuals. The appetite is often good, and sometimes voracious, but it may be deficient. For some time after eating there may be no discomfort; but sooner or later pain comes on in the region of the stomach, at first dull, afterwards more severe. A feeling of fullness and distension follows, accompanied by flatulent discharge and the eructation of a sour liquid. The discomfort may sometimes deepen into nausea and vomiting. The pain occasionally shoots up towards the shoulders, and may run down the left arm, like the pain of angina pectoris. From this, however, it may be distinguished by the fact that it comes on after food. The pain is due partly to over-sensitiveness of the stomach, and partly to the irritation of its acid contents, especially of butyric acid. When the pain is of a paroxysmal character it is called Gastralgia or Gastrodynia. Cardialgia or heart-burn, and Pyrosis or water-brash, are common symptoms which have also been dignified with special names. The former is said to be caused by the irritation of the upper end of the stomach by the fumes of its acrid contents, while the latter is essentially an abortive act of vomiting accompanied by a gush of saliva (Roberts).

In the treatment of indigestion the diet should be strictly regulated. The experience of the patient is often a better guide as to details than all the dicta of the faculty. The food should be properly cooked and well masticated, and the interval between meals should neither be too long nor too short. Where the appetite is feeble food must be taken frequently, in small quantities at a time; and it is often advantageous to use substances which have been partially digested with pancreatic or peptic extract. A mixture of animal and vegetable food is in general more easily digested than either kind taken exclusively. Mutton, fowls, and game are the most digestible kinds of animal food; roast beef is to be preferred to boiled; but pork and all cured meats, such as salted beef, ham, tongue, and all greasily-cooked dishes should be avoided. Cheese, pastry, raw vegetables, such as salads, cucumbers, &c., must also be prohibited. As a rule, dyspeptic persons would probably do well to avoid all stimulating drinks; but in some cases a little cold, weak brandy and water, or a glass of old sherry, or a little bitter ale may be taken with advantage.

It is of great importance to attend to the bowels (see CONSTIPATION). Regular exercise in the open air should be enjoined. Riding exercise is of special service where the liver is out of order. In some cases change of scene and occupation is of more benefit than anything else. In the medicinal treatment of dyspepsia a host of remedies are in vogue. Acids (especially nitro-hydrochloric acid), either before or after meals, bitters (such as quinine, calumba, gentian, quassia, and hops), and nux vomica increase the appetite and aid digestion. Pepsin is a valuable adjuvant. Nausea and vomiting may be checked by hydrocyanic acid, chloroform, and creasote in very small doses, or by ice and alkalies. Hyposulphite of soda, sulphurous acid, and carbolic acid act well when the vomiting depends on fermentation. For flatulence, bismuth, cardamoms, charcoal, sulpho-carbolate of sodium, hot water, and many other remedies are in use. For the pain in the stomach the subnitrate of bismuth in drachm doses has a well-merited reputation. Spirits of chloroform, followed by hot water, may also be used. The subcutaneous injection of morphia gives effectual relief for the time, but it should not be employed without advice. In nervous dyspepsia, hydrochlorate of cocaine in doses of a quarter of a grain has lately been used with success.

**Indigirka,** a river in the Siberian government of Yakutsk, rises in a western offset of the Stanovoi Mountains, and, after a northerly course of 870 miles through a desolate and frozen desert, falls into the Arctic Ocean in 71° N. lat. and 150° E. long.

**Indigo** (Gr. *Indikon*, 'Indian drug'), a most important vegetable dyestuff, yielding a beautiful blue and very durable dye, the basis also of the best black dye in woollen cloths. It has been used in India from a very early period, and was imported thence by the ancient Greeks and Romans, but was lost to Europe during great part of the middle ages—although the cultivation of the plant and preparation of the dye were described by Marco Polo in the 13th century -until re-introduced by the Dutch about the middle of the 16th century. The plants that yield the best indigo belong to the genus Indigofera, of the natural order Leguminosæ, sub-order Papilionaceæ. *Indigofera tinctoria* is the species most generally cultivated in India. Central American and West Indian indigo is the produce of *I. anil* and *I. guatimala*.

Indigo Plant (*Indigofera tinctoria*):
*a*, raceme of seed-pods. (From Bentley and Trimen.)

Indigo is, however, obtained from plants of other genera, particularly from *Wrightia tinctoria* (natural order Apocynaceæ), East Indies; *Baptisia tinctoria* (natural order Leguminosæ), North America, which yields indigo of a pale colour and very inferior quality; *Tephrosia tinctoria* (natural order Leguminosæ), Malabar; *T. Apollinea*, Egypt and Nubia; *Marsdenia tinctoria* (natural order Asclepiadaceæ), in Sylhet; and *Polygonum tinctorium* and *P. Chinense* (natural order Polygonaceæ), China and Japan.—In times when East Indian indigo was not known, or was brought to Europe only in small quantity, the same dyestuff was obtained from Woad (q.v.).—A coarse kind of indigo, called Bastard Indigo, was also at one time made in North America from the young shoots of *Amorpha cærulea* and *A. fruticosa* (natural order Leguminosæ).

In cultivating the indigo plant the seed is sown in drills about one foot apart at the beginning of the rainy season. Hoeing and weeding require to be assiduously attended to to prevent the plants from being overpowered by weeds. The first crop is obtained in about three months after sowing. The stems are cut as the plants begin to flower, and quickly shoot up again, and in this way two and sometimes three crops are taken from the same plants in one season. Immediately the crop is cut it is tied in bundles and carried to the steeping vats to undergo the process of extracting the indigo; for an account of which see DYEING.

Commercially speaking, indigo may be said to be the produce of India and Central America, as these are the only localities which supply the recognised form of the article. Bengal is the chief seat of indigo produce; and Bengal indigo is the most esteemed. The total quantity imported into Great Britain in 1884 was 104,423 cwt. (value £2,483,931); in 1888, 78,128 cwt. (value £1,702, 232). The imports into the United States in 1887 were 34,690 cwt. (value $2,734,000). From 1740 till the civil war indigo was much grown in Georgia and South Carolina. The market price varies from 4s. 6d. to 6s. 6d. per lb.

*Green indigo*, called *Lo-kao* by the Chinese, is
substance resembling indigo, which is obt
from a tree called *Hom-bi*; it is highly val
the Chinese artists as a pigment, and also
beautiful permanent green colour to co
silk cloths. It is, however, so costly th
can, unless differently prepared, be
ing material.

The indigo of commerce is by
geneous body. Its essential
constituent is *Indigotin* or *Ind*
but it likewise contains *In*
*Red*, and other ingredients.
Munich, after many years
nounced the successful syn
indigo from phenylacetic ac
See DYEING, Vol. IV. p. 142

**Indigo Bird** (*Cyanosp*
American bird of the Finch f
native of the United States,
Missouri, which it visits in su
America, where it spends the w
5½ inches in length, of a bea
variously tinged and shaded.
places on the edges of woods, and
song.

**Indium,** a metal (trivalent; atom. wt.
soft, silver-white, malleable, soluble in hy
acid; its sulphate forms alums with alkali
phates. It was discovered in 1863 by Reic
Richter in Freiberg zinc-blende, through obs
ing in its spectrum two characteristic indigo-blue lines.

**Individualism.** See SOCIALISM.

**Indo-China,** the eastern of the two great Asiatic peninsulas which extend southwards into the Indian Ocean, sometimes called Further India. It is washed on the east by the Gulfs of Tonquin and Siam and the Chinese Sea, and on the west by the Bay of Bengal. Accounts of the various states which it embraces will be found under the headings ANNAM, BURMA (with map), CAMBODIA, COCHIN-CHINA, MALACCA, SIAM, and TONQUIN.—The term *Indonesia* is sometimes used for the Indian Archipelago, the islands to the south-east of Asia.

**Indo-Europeans.** See ARYAN.

**Indore,** a Mahratta principality of India, comprising the territories of the Holkar dynasty, and consisting of several detached tracts, covers an area of 8400 sq. m. The bulk of it lies between Sindhia's dominions on the north and Bombay Presidency on the south, its length from north to south being 120 miles, and its breadth 82. It is traversed from east to west by the Nerbudda, which almost bisects it; by the Vindhya Mountains, their loftiest point within its limits being 2500 feet above the sea; and by the Satpura Mountains. Principal products, poppy, cotton, tobacco, wheat, rice, millets, &c.; principal industries, cotton and opium manufacture. Pop. (1881) 1,054,237. The Vindhyas and Satpuras have from time immemorial been the home of the Bhils (q.v.), the wildest of the aboriginal tribes in India. The Holkar State Railway connects the Rajputana railway-system with that of Bombay. The climate is sultry, the thermometer ranging from 60° to 90° F. in the shade. The state was founded about the middle of the 18th century by Malhar Rao, a soldier of fortune, who served the Peshwa. In 1818 the ruler of the Holkar dominions was reduced to the position of a feudatory prince of the British Indian empire. He keeps up an army of 8900 men.

**Indore,** the capital of the Maharaja Holkar's
nions, is situated in 22° 42′ N. lat. and 75° 54′
g., 1786 feet above sea-level. Pop. (1881)
ostly Hindus. During the revolt of 1857,
he maharaja remained faithful to the
vernment, his troops mutinied on 1st
g their prince a prisoner in his own
hering many Europeans in cold
ates only from 1770. Close to
t specially set apart for the
or-general of India's agent
thin this district stands a
spital.

term generally used to
e name of the holder on
ange or promissory note,
g it to another. Signing
s a blank indorsement;
named it is an indorse-
ull.' The usual form is
igned) A. B.' In Scot-
tents to C. D. or order.
personal liability is to be
hout recourse' are added,
and can come back on the
therwise be liable. The
so frequently used in Eng-
matters written or indorsed
r deeds, as indorsements on
of summons, &c.

of one of those Hindu deities
d more especially in the Vedic
religion, but enjoyed a great
y also in the Epic and Puránic
R'ig-Veda hymns which form
n of Vedic poetry Indra is a
ruler of the bright firmament, and his principal feat is that of conquering the demon *Vr'itra*, a symbolical personification of the cloud which obstructs the clearness of the sky and withholds the fructifying rain from the earth. All his wonderful deeds are performed by him merely for the benefit of the good, which, in the language of the Veda, means the pious men who worship him in their songs, and invigorate him with the offerings of the juice of the Soma plant. He is therefore the 'lord of the virtuous,' and the 'discomfiter of those who neglect religious rites,' and at the same time he has all the attributes of a warlike god, and is invoked as the destroyer of cities. During the Epic and Puránic periods, where ethical conceptions of the divine powers prevail over ideas based on elementary impressions, Indra ceases to enjoy the worship he had acquired at the Vedic time, and his existence is chiefly upheld by the poets, who, in their turn, however, work it out in the most fantastic detail. A remarkable trait in this legendary life of Indra is the series of his conflicts with Krishna, an incarnation of Vishnu, which end, however, in his becoming reconciled with the more important god. When represented in works of art Indra is generally seen riding on his elephant; and where he is painted he is covered with eyes.

**Indre,** a department of France, formed principally out of the western portion of the old province of Berri, lies immediately south of the department of Loir-et-Cher. Area, 2623 sq. m., of which about four-fifths are in tillage and pasture. Pop. (1872) 277,693; (1886) 296,147. The department is quite flat, and well watered by the Indre (which flows, from the department of Creuse, 152 miles northwestward to the Loire) and the Creuse. It contains three well-marked districts—a stony, woody region with sandy soil in the south, a fertile agricultural region in the east, and in the north-west a region of moors, marshes, and ponds, interspersed with forests. The more notable products are wheat, oats, potatoes, turnips, fruits, and wine. The sheep are excellent as food, and produce first-rate wool. Much poultry is reared. The principal industries are ironworks and manufactures of cloth, paper, leather, and porcelain. The department is divided into four arrondissements—Châteauroux, Le Blanc, Issoudun, and La Châtre. The capital is Châteauroux.

**Indre-et-Loire,** a department of France, formed chiefly out of the ancient province of Touraine, is crossed by the Loire from NE. to SW. Area, 2360 sq. m.; pop. (1872) 317,027; (1886) 340,921. The department is watered by the Loire and its tributaries, the Cher, Indre, and Vienne, all of them navigable. The valley of the Loire is very fertile, studded with orchards and gardens and vineyards; it is called the 'garden of France.' South of this lies the monotonous but productive plateau of St Maure, north of it the sterile region of Gâtine. The products include grain, wine (about 22,000,000 gallons annually), fruits (especially plums), and hemp. The industry has never recovered from the blow struck by the Edict of Nantes. The chief manufactures are powder, files, cloth, paper, and leather. The department is divided into the three arrondissements of Tours, Chinon, and Loches; capital, Tours.

**Induction,** one of the great processes of scientific discovery and proof. It is the operation of *discovering* and *proving* general propositions; while deduction, on the other hand, is the method of *applying* general propositions once discovered to particular cases considered to be included within their scope. By induction we establish the law that heat expands bodies; by deduction we apply it to explain why a clock goes slower in summer than in winter, owing to the changes of the length of the pendulum. It should be mentioned that what has been called *perfect* induction—the observation of *all* the instances and a statement of the result in one general proposition—is not by Mill or the moderns recognised as proper induction at all.

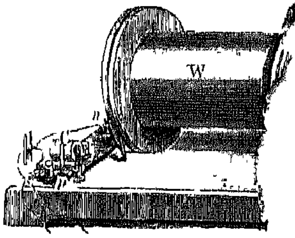
Induction is the process of real inference—in other words, by it we proceed from the known to the unknown; or from a limited range of facts we affirm what will hold in an unlimited range. All things that we do not know by actual trial or ocular demonstration we know by an inductive operation. Deduction is not real inference in this sense, since the general proposition already covers the case that we apply it to; in a proper deduction the conclusion is more limited than the premises. By the inductive method we obtain a conclusion much larger than the premises; we adventure into the sphere of the unknown, and pronounce upon what we have not yet seen. Nothing is more common than the making of bad inductions, and accordingly it is now considered a part of logic to lay down the rules for the right performance of this great operation. For the principles and rules of induction, see Mill's *Logic* (book iii.), Fowler's *Inductive Logic*, and Venn's *Principles of Empirical or Inductive Logic* (1890); and see the article LOGIC.

**Induction** is a term used in England to denote the investing or giving possession of a benefice to a clergyman. This is done by a mandate from the bishop to the archdeacon (in some places the dean and chapter) to make the induction. The inductor takes the clergyman by the hand, and lays it on the key of the church-door (or some part of the church itself), then opens the door and causes him to enter the church alone, and to toll one of the bells as a public notification to the parishioners. The incumbent's possession of the benefice is completed by 'reading himself in'—i.e. reading, generally on the following Sunday, the Thirty-nine Articles, and immediately thereafter making a formal declaration of assent to their doctrine, and giving a pledge of his conformity to the rules of the church.—In Scotland the presbytery induct the minister.

**Induction**, in Electricity and Magnetism, is a term of various application. In every case, however, there is a certain idea present—the idea, namely, of an effect produced at an apparent distance from the producing cause, the effect being essentially a reproduction of the cause. More accurately stated, induction is the name of a method or mode by or in which a particular electric or magnetic condition is made to pass from one material system to another without the intervention of any obvious material connection. Thus, in static electricity a metallic body or other conductor brought into the neighbourhood of an electrified body becomes itself electrified by induction. Similarly, a piece of iron or other magnetisable metal, when brought near a magnet, or, more generally, when brought into a magnetic field, becomes itself magnetised by induction. Indeed, according to Faraday's view, induction is the essential feature in all electric and magnetic interaction. These two fundamental cases of induction will be found treated in full under ELECTRICITY and MAGNETISM.

There is, however, a third and very important group of electric and magnetic phenomena to which the name induction belongs. These were discovered by Faraday, and will be treated in a general way under MAGNETISM. The essential peculiarity of this class of induction phenomena is the production of electric currents in conductors or circuits in which there exists no source of electrical energy. These induced electric currents are in all cases the result of some magnetic change in the region occupied by the conductor. This magnetic change may be produced by the approach or withdrawal of a magnet; or it may be produced by the motion of the conductor in a constant magnetic field; or it may be due to variations of primary currents in neighbouring conductors, or even in the conductor itself. In this last case the variations of these primary currents cause corresponding variations in the magnetic fields existing with them, so that the induced current can always be explained in terms of a magnetic change. According to Ohm's Law (see ELECTRICITY), the strength of a current flowing through a given circuit depends on the electromotive force which excites the current, and on the resistance of the circuit through which the current is made to flow. In the case of induction of currents the electromotive force is directly due to, and is measured in terms of, the rate of change of the number of lines of magnetic force embraced by the circuit; and this rate of change depends on the geometrical form of the circuit and on its space relations to the magnetic field surrounding it. Thus the induced current depends on three things—viz. the form of the circuit, the varying space relations of the circuit and the magnetic field, and the ordinary ohmic resistance of the circuit.

One of the readiest ways of producing induced currents is to have two coils of wire, one placed inside the other, and to pass through the inner or *primary* coil a current of varying strength. At every variation of the primary current a current is induced in the outer or *secondary* circuit. The direction of the secondary current depends on the manner of change of the primary. If the primary current is decreasing in strength, the induced current in the secondary circuit flows in the same direction as the primary in its circuit; but if the primary current is increasing, the secondary current flows in the reverse direction. The best effects are produced at the 'making' and the 'breaking' of the primary circuit; for by these operat
the primary current is made to have its g
variations. This is the principle of actio
*Ruhmkorff Induction Coil*, one of the ma
of which is shown in the figure. Th
wound, the primary inside the second



portion marked W. The ba
to the binding screws, *p*, *n*, a
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the secondary coil are fixed to
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with pointed rods capable of univer
The true way of looking at the acti
instrument is to regard the primary ca
the source of a magnetic field within and
the coils. To intensify the magnetic fiel
usual to introduce a soft iron core into the c
of the coils. In virtue of magnetic induction
iron core, under the influence of the magnetic force due to the primary current, becomes powerfully magnetised, and the magnetic field within the coil greatly increased. When the primary current is interrupted the iron core loses nearly all its magnetism, and accompanying this great decrease in the strength of the magnetic field an intense induced current flows in the secondary circuit. Now

it is only when the magnetic field is varying that the induced electromotive force exists; and, since in a given secondary circuit the total current induced is proportional to the total change in the magnetic field, it follows that the more abrupt this change the more concentrated will be the flow of the secondary current.

In the induction coil matters are so arranged that the induced current is sufficiently concentrated to pass across a considerable air-space, which really forms part of the secondary circuit. By taking the terminals of the secondary circuit in our hands we may make ourselves part of this circuit, and experience the curious throbbing sensation of a galvanic shock. Or we may attach the terminals to the platinum wires of a Geissler tube, and produce the beautiful effects of electric discharge through gases in a state of great rarity. In most forms of induction coil the primary current is broken and made automatically, the varying magnetic strength of the iron core being used for this purpose. When the primary current passes, the iron core becomes a powerful magnet, and attracts a small iron disc set opposite one end. By means of a simple form of lever attachment this disc when so moved interrupts the primary circuit. The current then ceases to flow, the iron core loses most of its magnetism, and the small iron disc thus freed returns to its original position. With this return of the disc the primary circuit is again completed, the current flows as before, and the same order of effects is repeated, and so on indefinitely. In the secondary coil there is, of course, a possible induced current at make as well as at break. But, as in such instruments
he corresponding magnetic change is not nearly
id at make as at break, the induced current
so concentrated. Hence, practically, in
with an induction coil we have to do only
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small piece of metal or
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man Catholic theology,
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eory, remains due after
punishment have been
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grievous crime, especially
adultery, such sinners
urch communion for vari-
ases even till the hour of
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recommendation of martyrs or confessors, is held by Catholic theologians to be an illustration of that principle of vicarious atonement according to which, in the theory of indulgences, the church is supposed to supply from the inexhaustible treasure of the merits of Christ, and of the 'supererogatory' works of the saints, what may be wanting to the completeness of the atonement of the less perfect but yet truly penitent sinner to whom she grants the indulgence. That this practice of relaxation, whatever may have been its real import, was to be used according to the judgment of the bishop as to the disposition of the penitent, is expressly laid down by the Council of Ancyra in 308 and by that of Nice in 325. In all cases, however, the person granting the relaxation was to impose certain good works as a partial substitute for the penalty which had been relaxed; and among these works, which had at first been purely personal, came by degrees to be included money payments for certain religious or charitable objects, as the building of a church or the foundation of a monastery or hospital.

The name indulgence appears to have originated late, the first recorded instance of its use being by Alexander II. in the 11th century; but the institution itself is found in full development during the wars of the Crusades, the serving, or the contributing to service in which, 'provided it were for devotion alone, and not from motives of greed or of glory,' was accepted in the Council of Clermont 'as an equivalent substitute for all penance.' Such an indulgence was called 'plenary;' where a portion only of the penitential works was relaxed it was called 'partial;' and in order to put a bar to their excessive multiplication and to other abuses Innocent III. declared the power of granting 'plenary indulgences' to be reserved to the pope alone, bishops being only authorised to grant the 'partial' or limited indulgences described above. The fourth Lateran council condemns the 'indiscreet and superfluous' granting of indulgences; and among the abuses which grew up in the church during the western schism one of the most remarkable was the lavish dispensation of indulgences, in the granting of which the contending popes rivalled each other in prodigality. The last extreme, however, was not reached until the beginning of the 16th century, when, with a view to raising the funds necessary for the erection of the great church of St Peter's at Rome, the pope, Leo X., published a plenary indulgence, the principal condition for the gaining of which was a contribution to this work. Catholic historians contend that in itself such a condition was perfectly justifiable, and that if duly explained to the people it might be lawfully and even meritoriously complied with; but they admit that Tetzel and many more preachers of the indulgence in extolling its natural effects went to indefensible extremes, and that, even making the fullest allowance for exaggeration, it cannot be denied that grievous abuses both of doctrine and of practice were committed in Germany and in Switzerland. Hence the decree of the Council of Trent, while it affirms that the use of indulgences, as being 'most salutary for the Christian people, and approved by the authority of councils, is to be retained in the church,' yet orders that 'in granting them moderation be observed, lest by excessive facility discipline may be enervated.' Upon the special instructions of this council all the modern legislation on the subject of indulgences has been founded; but as the decree of the council does not explicitly declare what is the precise effect of an indulgence it is further explained by Pope Pius VI., in his celebrated bull *Auctorem Fidei*, that an indulgence received with due dispositions remits not alone the canonical penance attached to certain crimes in this life, but also the temporal punishment which would await the penitent after death to be endured by him in purgatory.

From the above explanation it will be gathered that Catholics do not understand by an indulgence a remission of sin, much less a permission to commit sin or a promise of forgiveness of future sin. They contend, moreover, that, since the benefit of an indulgence can only be enjoyed by a sinner who has repented of sin and resolved to embrace a new life, the imputation of introducing laxity of principle and easy self-indulgence is entirely unwarranted. And although for the most part the good works which are required as the condition of obtaining indulgences may appear easy and even trivial, yet the one indispensable preliminary—sorrow for sin and sincere purpose of amendment—in itself involves the very highest effort of Christian virtue.

**Indulgence,** THE DECLARATION OF, the proclamation of James II. in 1687, by which he promised to suspend all laws which tended to force the consciences of his subjects. His real aim was of course merely to relieve the Roman Catholics; hence the declaration was very unpopular, and the refusal of the Seven Bishops to command their clergy to read it from their pulpits was but the culminating point of universal public dissatisfaction. Two similar indulgences in English history were those issued by Charles II. in 1662 and 1672, both of which were equally unpleasing to the dissenters alike in England and Scotland, who declined to share their toleration with their Roman Catholic fellow-subjects.

**Indus** (Sansk. *Sindhu*), a river of India, which rises in an unexplored region in Tibet, near the sources of the Sutlej, in 32° N. lat. and 81° E. long. The precise spot is said to be 16,000 feet above the level of the sea, and to be on the north side of the Kailas Mountain. Its general course is at first towards the north-west, through Tibet and Cashmere. Here it is known as the Singh-ka-bab. In the north-west of Cashmere, in about 34° 50′ N. lat. and 71° 30′ E. long., it turns abruptly southwards, and follows that direction, varied by stretches to the south-south-west, right down to the sea. In the mountains its current is very rapid; the river passes through deep, wild gorges (one near Iskardoh, in north-west Cashmere, having a sheer depth of considerably more than 10,000 feet), and is liable to floods, which come with terrible swiftness, rise very high, and cause tremendous damage. The Indus enters the Punjab 812 miles from its source. Near Attock (q.v.), 48 miles lower down, it receives the Kabul River from Afghanistan, and then becomes navigable. Here it is only 2000 feet above sea-level. 450 miles below Attock it receives, on the left, the accumulated waters of the Punjab through the single channel of the Panjnad. Each of the 'five watercourses,' as well as the Kabul, is practicable for inland craft to the mountains. Below its confluence with the Panjnad the Indus, instead of increasing in volume, becomes gradually less. Its basin is narrow, and the affluents are insignificant, while there is a great loss by evaporation. The river also divides into numerous channels, many of which become lost in the sand, while others return much shrunken in volume. The delta of the river covers an area of about 3000 sq. m., and extends for some 125 miles along the Arabian Sea. The main channel is constantly shifting. The delta is not on the whole very fertile, and is almost entirely destitute of trees. In both Punjab and Sindh the bed of the river is littered with islands and sandbanks. The cultivation of the arid plains through which the lower Indus passes is dependent upon the annual overflow of the river and artificial irrigation fed by that overflow. The total length of the river is estimated at somewhat more than 1800 miles, and the area of its drainage basin at 372,700 sq. m. The Indus abounds with fish of excellent quality, and is infested by crocodiles. Before the opening of the Indus Valley Railway in 1878 the river was necessarily the principal means for the transmission of commerce; but since that event the railway has very greatly superseded navigation.

**Industrial Schools.** This term is used very variously, sometimes being synonymous with Ragged Schools, in which mechanical arts are taught; sometimes designating ordinary elementary schools, in which agricultural or some other industrial art is taught to the boys during one portion of the school-day, or in which sewing, cooking, washing, and ironing are taught to the girls. See EDUCATION, TECHNICAL EDUCATION, RAGGED SCHOOLS.

**Inebriates,** RETREATS FOR. The Habitual Drunkards Act, 1879, amended and made permanent by the Inebriates Act, 1888, has made provision for the licensing of institutions for the reception and treatment of habitual drunkards. By these acts an inebriate may sign a bond before two justices of the peace for a period not exceeding twelve months, under which the licensee of the retreat has power to detain and control him during the time specified. No provision is made for the committal of any one against his will; nor for the establishment of retreats for the reception of persons unable to pay for their maintenance. Although the acts apply to the whole of the United Kingdom, no retreat has yet been licensed in S
land or Ireland. In England there were i
seven retreats; ninety-nine patients were ad
under the acts during the year, and forty-ni
still under treatment at its close. W
necessarily limited sphere of their op
acts appear to work well; but no
available in the official reports to i
portion of cures effected.

Besides the retreats licensed
are numerous other institutions
patients are received without
detain them.

In America there were in
hospitals, with over 1000 pat
of the Union, inebriates
committed to these institu
that 'in fully 3000 cases, 35 p
had remained under treatme
had been permanently restored

**Inertia** (Lat., 'inactivity'
perty of matter, fully describe
law of motion, which asserts
*perseveres in its state of rest or o*
*in a straight line except in so far as*
*by force to alter that state.* Part of th
was known to the ancients, and by th
uted to a certain repugnance to motio
was a characteristic of all matter; but
shown by Galileo that just as the body a
could not of itself begin to move, so the b
motion could not of itself come to rest.—
*Moment of Inertia* is the sum of the products of every particle of a mass into the corresponding distance from a given point or axis of rotation.

**Ines de Castro.** See CASTRO.

**Infallibility,** the immunity from error, in all that regards faith and morals, which is claimed by the Roman Catholic Church, and, at least as regards the past, by the Greek Church, as represented in the decrees of the councils which that church looks upon as ecumenical. The latter claim, however, which does not go beyond that of *inerrancy*, or actual exemption from error up to the present time, differs widely from that of infallibility, as put forward by the Roman Church, which involves not alone an actual historical immunity from error, but also such a positive and abiding assistance of the Spirit of God as will at all times both protect against the possibility of error and guide and direct in the faithful teaching of all necessary truth. The infallibility claimed by the Roman Church is thus of two kinds, *passive* and *active*—the first (Matt. xvi. 18), in virtue of which the church never can *receive* or *embrace* any erroneous doctrine, no matter by whom proposed; the second, in virtue of which she is charged with the function (Matt. xxviii. 19; Mark, xvi. 15; Ephes. iv. 11–16) of permanently *teaching* to the world the essential truths of God, of actively resisting every access of error, and of authoritatively deciding every controversy by which the oneness of belief among the faithful may be endangered. Catholics regard this gift as a natural and necessary accompaniment of the authority in matters of faith with which they believe the church to be invested, and which, if not guided in its exercise by such infallible assistance, would be but a false light and an attractive but dangerous instrument of delusion.

Such is the notion of infallibility as claimed by the Roman Church. Two very important and practical questions, however, arise regarding it, both of which have been the occasion of much controversy even among Catholics themselves: (1) as to the *subject*—the seat or the organ of this in-
llibility, and (2) as to the *object*—the matters
it extends.
the first, all Catholics have been agreed
dy of bishops, morally speaking, through-
rch, acting in common with the pope,
most perfect organ of the infallibility
nd hence, that when they unite in
assembled in a general council
their judgment is infallible.
ecree was addressed officially
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itly accepted by the bishops,
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e pope and the bishops, all
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lding *as an article of Catholic*
ad not received the assent of
hops. By the decree of the
70) this controversy was decided
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when the Roman Pontiff speaks
is, when he, using his office as
or of all Christians, in virtue of his
e defines a doctrine of faith and
held by the whole church—he by the
tance, promised to him in the blessed
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emer was pleased to invest his church
ion of doctrine on faith or morals, and
re such definitions of the Roman
reformable in their own nature and
of the consent of the church.' See

On the matters or subjects to which the gift of infallibility extends Catholics are agreed in one principle, that it embraces all those subjects, and those only, which are necessary for the maintenance of divine truth in the church. Hence, presupposing divine revelation, either written or oral, it embraces all questions of faith and morality, all subjects of general discipline, so far at least as to preclude the introduction, by authority of the church, of any discipline which should be injurious to faith or to morality. On the other hand, it does not embrace questions of science, or matters of fact, or abstract opinions unconnected with religion. On this point all Catholics have been agreed. But a very celebrated dispute arose in the 17th century, on occasion of the *Augustinus* of Jansenius, as to the infallibility of the church in judging of books, out of which originated the well-known Jansenist distinction of *law* and of *fact* (see JANSENISM). On this subject it will be enough to say that all Catholics are now agreed in recognising as a necessary condition to the effective infallibility that it should extend to the judgments upon books so far as to decide whether the doctrine contained therein may or may not be opposed to sound faith or morality.

[The Vatican Council produced a large literature, including Cecconi, *Storia del Concilio Vaticano* (1873); Frond, *Actes et Histoire du Concile Œcuménique de Rome* (8 vols. 1870–73). Salmon's *Infallibility of the Church* (1889) discusses the doctrine controversially from the Protestant point of view.] See also BASEL (COUNCIL OF), POPE, ROMAN CATHOLIC CHURCH, &c., and works there cited.

**Infamy,** in Law, was a stigma attaching to the character of a person so as to disqualify him from being a witness. It was distinguished into infamy of fact and infamy of law. Infamy of fact results from a depraved course of life and abandoned character, of law from the sentence of a court finding the person guilty of any crime to which the character of infamy attached. Since 1843 it has not been possible to exclude a witness on the ground of infamy, though questions as to character and as to crimes committed by a witness may be asked with a view of affecting his credibility.

**Infant,** in English law, is a term which includes all persons under the age of twenty-one. Such persons are subject to special rules of law, which may be summarised as follows:

(1) *Crime.*—A child under seven cannot be convicted of crime; a child between seven and fourteen can be convicted if it is shown that he knew the nature of his act. A boy under fourteen is presumed incapable of rape.

(2) *Marriage.*—Boys under fourteen and girls under twelve cannot contract marriage. As a general rule, infants of marriageable age require the consent of parents or guardians to marry; but the absence of such consent does not affect the validity of a marriage actually solemnised. A person procuring the marriage of an infant by fraud forfeits any property which accrues to him or her from the marriage.

(3) *Property and Contract.*—An infant may acquire and dispose of property, enter into contracts, and carry on business; but he is privileged to repudiate liability for his acts, except in certain cases. Contracts for necessaries (i.e. for things suitable to the infant's position in life) are binding on him; and settlements, &c., executed with the approval of a judge, in terms of certain acts of parliament, are also binding. On coming of age an infant may confirm or rescind any act by which he has acquired or disposed of property during infancy; if he continues to hold property acquired, he must perform obligations connected with it: if e.g. he has acquired shares in a company, he must

pay calls on them. If he has entered into a continuing contract (e.g. a contract of partnership), he is taken to have confirmed it, unless he rescinds and ceases to take the benefit of it within a reasonable time. As for his other contracts, he might formerly have confirmed them by an *express* ratification; he is now precluded from doing so by the Infants' Relief Act of 1874, which enacts that no action shall be brought on the ratification of a promise made during infancy. No will made by a person under twenty-one is valid. An infant may bring an action by his *prochein ami* or next friend (usually his father, if living). If an action is brought against him, a guardian *ad litem* may be appointed. A parent or guardian is not liable for the debts of an infant, unless he has expressly or by implication contracted to pay them. An infant may contract as agent for a person of full age; in this case his acts are regarded as the acts of his principal.

In Scotland the law differs in many respects from the law of England on this subject. The term infant is not used at all in a technical sense. All persons, if male, are in legal strictness called pupils till fourteen, and if female, till twelve; and from fourteen or twelve to twenty-one they are *technically called minors. In general, the contracts* of a pupil are absolutely void, and he is under the care of tutors, who are either his parents or others appointed by the court. A minor, on the other hand, may enter into contracts; but if they are to his lesion or prejudice he can reduce or set them aside any time within four years after majority. Moreover, if a minor go into trade, his contracts bind him, as they do other persons. Further, a minor can make a will or testament, operating on his movable estate, though he cannot alienate his heritable estate in like manner. The four years which are allowed to him after majority to consider whether he will set aside contracts are called *quadriennium utile*; and if he can prove lesion he is in that period entitled to restitution. In Scotland, also, a minor may marry as freely as if he were a major, and, indeed, he is in general his own master, or *sui juris*, at the age of fourteen (a female at twelve). See the article AGE.

**Infant,** FEEDING OF. When the health and strength of the mother admit of it, there is no doubt that the food provided by nature is far the best suited for infant nourishment. In this case the child should be fed entirely on breast milk for the first six or eight months at least, and partially for the remainder of the first year of life. Beyond this period, nursing is usually injurious to mother and child, but is often continued because of the idea that it tends to prevent pregnancy. If from any cause the mother is unable to nurse her infant, a wet-nurse is the best substitute; though the improvement effected in the preparation of artificial foods has rendered this method of bringing up infants less common than it used to be. The selection of a suitable nurse should be entrusted to the medical adviser, and is a responsible and difficult duty. When neither of these methods is available, the milk of some animal has to be used. Goats' milk and asses' milk have both been recommended, as more nearly resembling human milk than cows' milk does; but, as they are almost always difficult to procure, while cows' milk is abundant and cheap, it is this which in the vast majority of cases must be employed. The differences between human milk and cows' milk must therefore be recognised and allowed for. They may be summed up as follows: Cows' milk contains much less sugar, rather less fat, and considerably more albuminoids than human milk; and under the action of acids a much larger proportion of albuminoids coagulate, and form a much firmer clot in the former than in the latter. To assimilate cows' milk as closely as possible to the natural food of the infant, it must be modified in some such way as the following: One tablespoonful of milk to be mixed with half a tablespoonful of cream, two tablespoonfuls of water (boiled), and a quarter of a teaspoonful of milk sugar for each meal during the first month. If the cows' milk still forms too firm a clot, a tablespoonful of lime water, or of barley water, may be substituted for one tablespoonful of plain water; or a little solution of gelatine, or of one of the prepared foods for infants, such as Mellin's, may be added. The quantity of milk, &c. must be gradually increased as the child grows, till at the sixth month it has nine tablespoonfuls of milk, one of cream, two of water, and a teaspoonful of milk sugar at each meal. It is sometimes, but not generally, necessary to secure a supply of milk from one cow. If ordinary milk disagrees, predigestion (by Benger's liquor pancreaticus or Fairchild's peptonising powder) may overcome the difficulty. If milk cannot be borne in any form, some substitute (prepared 'infants' food,' chicken broth, raw meat juice, &c.) must be used. But in all such difficult cases, medical advice should be sought.

There is no more fruitful source of illness in infants brought up on the bottle than imperfect attention to cleanliness, which leads to souring of the milk and severe indigestion. There should always be at least two bottles, tubes, &c. in use; and after a meal the apparatus should at once be taken to pieces, thoroughly cleansed with soda and water, and left steeping in fresh boiled water till it is required. No cork, wood, or other absorbent substance should be used in the construction of the *fittings of the bottle, as this renders perfect cle*
ness almost impossible.

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be enough, and two should co
food, well cooked (rusks, stale
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once or twice a day, or chicken-soup
After the first year the range of the
gradually increased, bread, mashed pot
broth, fish, chicken, well-boiled vegetable
gradually added. But many children thr
on milk and farinaceous food alone up to
three years of age, and if so may be allow
continue on that diet.

**Infante** (from the Lat. *infans*, 'an infant'), the title given in Spain and Portugal to the princes of the royal family, the corresponding title of INFANTA being given to the princesses. Since 1388, however, the heir-apparent to the throne in Spain has been styled the Prince of Asturias, and the heir-apparent in Portugal, until the separation of Brazil from the mother-country, bore the title of Prince of Brazil. The personal domain of an Infante or Infanta is called the *Infantado*.

**Infanticide**, or the murdering of infants, was common in ancient times, and still prevails in some barbarous communities. The practice existed in Greece and Rome, and even found defenders in Plato and Aristotle. The latter in his *Politics* said the law should forbid the nurturing of the maimed, and, where a check to population is required, abortion should be produced before the quickening of the infant. In Sparta, as in other Greek states, the law directed that when a child was born the father should carry it to an appointed place, there to be inspected by the elders of the community. If it was a promising child, they returned it to its parents to be educated; otherwise it was thrown into a cavern at the foot of Mount Taygetus. In ancient Rome the Twelve Tables directed malformed infants to be immediately destroyed, and by the Patria Potestas the father had an absolute power over his children extending to life and death; but the rigour of the paternal law both as regards the killing and the sale of infants was softened by subsequent legislation, and especially by Numa. Among the Norse the child's life hung in the balance till the father handed it to the nurse to be reared. If it was weak or malformed, or if the father disapproved of its living, the child was killed by exposure to the weather and to wild beasts. According to Cæsar the Gauls were invested with the power of life and death over their children, and so late as the 13th century the Poles killed imperfect children. Amongst the Arabs it required an ordinance to prevent the crime of killing children lest the parent should be re-
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n China infanticide was, and in the remoter parts of that vast country still is, common. One of the causes here is the right possessed by Chinamen of periodically repudiating their wives. Sometimes the infants were stifled by the midwives at birth, and sometimes they were cast into a neighbouring stream, where in some cases they were humanely kept afloat by a gourd, so that they might be saved from destruction by any compassionate person who might feel disposed. In early missionary times it was a part of the duty of missionaries to pick up and rear, or entrust to others for the purpose of rearing, the waifs who had been abandoned through the avarice, poverty, or callousness of their parents.

In nearly all the cases mentioned infanticide was prompted by religious or economic reasons, or indulged in from caprice or indolence; and it was permitted in deference to the power with which in primitive communities as well as in advanced states like Greece and Rome the father was endued. Modern civilisation deals very differently with the subject. In all European states, although they differ widely in their treatment of infanticide and cognate crimes, human life is from its first to its last hour held sacred, and whoever puts an end to it is a murderer. Almost the only motive which in such countries now leads to infanticide is that of shame—the parents incurring the risk of committing child-murder to escape social disgrace. The efforts therefore of legislators and criminal lawyers on the one hand have been directed to the repression of abortion, concealment of pregnancy, and murdering the new-born infant, and of philanthropists on the other to remove temptation to commit the graver crimes by providing Foundling Hospitals (q.v.), where the offspring of sin may find a refuge. See also ILLEGITIMACY.

In England and Scotland the inexcusable killing of infants is theoretically murder, and the only excuse for killing the fœtus is the safety of the mother; otherwise, Abortion (q.v.) is a criminal offence. The concealment of birth is also a criminal offence; see BIRTH (CONCEALMENT OF). The destruction of children may be effected negatively by not supplying food and clothing, as well as by the positive act of wounding or ill-treating; and if a parent or other person who is bound by law to supply food and clothing to the child refuses or neglects to do so, thereby causing its death, such refusal or neglect amounts either to murder or manslaughter, according to the circumstances. Moreover, the unlawful abandoning or exposure of any child under the age of two years, whereby the life and health of the child are endangered, is a misdemeanour punishable with three years' penal servitude. Where a person is charged with the murder of a very young child it is essential to prove that the child was in life. Under a statute of James I. there were presumptions against the mother, but in 1803 the trials for offences of this class were placed under ordinary rules of evidence. The presumption which now obtains that every new-born child found dead was born dead is believed by certain jurists to have encouraged infanticide. The test of a child being born alive is not that it breathed, or had an independent circulation after it was separated from the mother; it is enough that the child was fully born. Hence, if a man strike a woman with child, so as to cause the death of the child, he is neither guilty of murder nor of manslaughter of the child. In all cases of the murder of infants the question whether the child was fully born, and so the subject of murder, is generally one of medical jurisprudence. In England and Wales the annual number of verdicts of murder of infants one year old and under varied in 1879-88 from 65 to 103. The above offences in reference to infanticide are punished in a similar manner in Scotland, where, though the killing of a completely born infant is murder, a verdict of culpable homicide is frequently returned. Concealment of pregnancy is the usual charge under 49 Geo. III. chap. 17.

It has been stated that every day an inquest is held upon the bodies of children destroyed through the design, the neglect, the ignorance, or the mental infirmity of the mothers. Even when the act may fairly be regarded as a crime, its enormity is generally greatly lessened in the eye of the law by the consideration of the physical condition and moral disturbance of the parent.

An Act of 1872 obliges those who undertake for hire to nurse infants under the age of one year, for a longer period than twenty-four hours, to have their house registered, and to keep records of the children they take charge of. They must also give notice to the coroner or procurator-fiscal of such infants' deaths, and are under obligation to keep sanitary houses. By an important statute passed in 1889 any person over sixteen who wilfully ill-treats, neglects, abandons, or exposes a boy under fourteen or girl under sixteen years of age, or causes or procures this to be done, in a manner likely to cause the child unnecessary suffering or injury to its health, is guilty of a misdemeanour, and is *liable to £100 of fine or imprisonment for* two years, or to both. Lesser penalties are inflicted on summary conviction. The fine may be increased where the offender is proved to be interested in the death of the child. See CHILDREN (CRUELTY TO), and BURIAL SOCIETIES.

**Infantry.** See ARMY.

**Infant Schools.** The subject has been already treated under Education (q.v.). But there still remain a few points to be adverted to. Pastor Oberlin (q.v.) may be regarded as the founder of infant schools. He appointed women in his own parish to assemble the little children between the ages of two and six, to interest them by conversation, pictures, and maps, and to teach them to read and to sew. The first infant school attempted in Great Britain was in connection with Robert Owen's socialistic establishment in Scotland. The education and training of young children were matters of great interest and study to Pestalozzi (q.v.). His system was adapted to English requirements by the Home and Colonial Infant School Society, founded in 1836. This society has done excellent work in training teachers and instituting model infant and juvenile schools. But the most successful system of educating quite young children is the Kindergarten (q.v.).

**Infection.** The grounds for believing that each of the large class of communicable diseases depends upon the presence within the body of a distinct living organism have already been stated (see GERM). The manner in which each of these supposed organisms behaves in originating fresh cases of disease is, however, almost as characteristic as the effects it produces on the body.

(1) In malarial or miasmatic diseases, chief among which is ague, though they present many analogies to truly infectious diseases, there is no evidence that the malady can be transmitted from the sick to the healthy. The disease poison is derived from soil, water, or air, in which it seems to live and multiply.

(2) Intermediate between these and the more characteristic infectious diseases is a group of which cholera and typhoid (enteric) fever may be taken as types. Here the infectious material has its origin chiefly from the dejecta of the patient, but seems to acquire infectious properties only after it has been some time (probably for several days) outside the human body.

(3) The largest and most typical class includes typhus, smallpox, measles, scarlet fever, hooping-cough, and many others. In all these the disease is directly and immediately communicable from the sick to the healthy. But there are striking differences in the conditions under which infection usually takes place. The poison of typhus, the dreaded 'jail fever' of past times, is rapidly destroyed by admixture with air, and the danger of its spreading can be much diminished by free ventilation. In smallpox the infection can retain its vitality for years on the walls of a room, or in the artificially dried discharge from the pustules; in scarlet fever it may exist for many months in articles of clothing. Measles is not least infectious in the early stage, when it presents merely the symptoms of a bad cold; scarlet fever infection is not at its worst till the rash has faded and the skin begins to be shed.

(4) The last group consists of those diseases in which the poison does not diffuse itself through the air, but requires to be directly inoculated to produce the disease—e.g. syphilis and hydrophobia.

This classification of diseases believed to be dependent upon organisms, though practically convenient, cannot be considered a strictly accurate one; for many of the diseases in group 3, perhaps all, can be propagated by inoculation, and the infection of some may be able to develop outside the body and behave like those in group 2. Enough has been said to show the complexity of the problems, both practical and scientific, presented by the subject. As to the Infectious Diseases Notification Act of 1889, and other cognate matters, see HYGIENE, DISINFECTANTS, CONTAGION, and the articles on the several diseases.

**Infeftment,** or SASINE, a Scotch law
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at the end of a predetermined number of hours or days, it shall cause the explosive substance to explode. For a statement of the uses to which this class of infernal machines has been put by the anarchist parties, see DYNAMITE. Fire-ships (q.v.) were employed in former times; and modern nations apply a similar principle in their torpedo boats (see TORPEDOES). Bombs or hand-grenades,

in so far as they have been employed for the felonious destruction of human life, must also be accounted infernal machines. The most notorious instances have been the unsuccessful attempt on Napoleon III. by Orsini (*q.v.*) in 1858 and the killing of Alexander II. of Russia in 1881. See also CHICAGO.

**Infidel,** amongst Christians, popularly means one who rejects Christianity as a divine revelation, but is not used of heathens (though they are *infideles*, Lat. 'unfaithful') or heretics. By Moslems Christians are called by a corresponding term ('giaour,' 'kaffir,' &c.). See ATHEISM, DEISM, APOLOGETICS, CHRISTIANITY, HERESY, PERSECUTION.

**Infinite.** In philosophy, infinite is that which is without any limitation, and, like absolute and unconditioned, is used especially of the Infinite, of God. As to our knowledge of the infinite, some (as Hamilton and Mansel) hold that the idea is purely negative; Descartes affirmed that the idea of the infinite was not merely the idea of an objective reality, but is implied as a necessary condition of every other. See ABSOLUTE, CONDITION; Cousin's *Cours de Philosophie*, Hamilton's *Discussions*, Mansel's *Limits*, Calderwood's *Philosophy of the Infinite*, Spenser's *First Principles*.

In mathematics, the term infinity and the phrases infinitely great and infinitely small are of constant occurrence; and the symbol $\infty$ is usually said to denote a magnitude infinitely great, the symbol 0 a magnitude infinitely small. Are these magnitudes infinitely great and infinitely small to be reasoned about in the same way as ordinary finite magnitudes? Are these symbols
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terminate forms; for methods
see Chrystal's *Algebra*, chap.
r's *Differential and Integral*

e name applied to the method
s the foundation of his Differential Calculus. Leibnitz considered magnitudes as composed of infinitely small elements or infinitesimals. Those elements which are infinitely small compared to any finite magnitude are infinitesimals of the first degree; those which are infinitely small compared to infinitesimals of the first degree are infinitesimals of the second degree; and so on. The principle of the method briefly stated is that two finite magnitudes are equal if they differ only by an infinitely small magnitude. Though the results obtained by the application of infinitesimals are seen to be always in accord with the results obtained by other methods, and a method which always leads to correct conclusions must be logically sound, yet the fundamental principle does not at first sight seem rigorously exact, and the method looks as if it were merely one of approximation. In consequence it has now come to be usual to found the calculus on the doctrine of limits.

**Infinitesimal Calculus.** See CALCULUS.

**Infirmaries.** See HOSPITAL.

**Inflammation** is the most important of all the morbid processes that fall under the notice of the physician or surgeon. The most obvious symptoms or phenomena of inflammation, when it attacks an external or visible part, are pain, redness, heat, and swelling. If a healthy man gets a splinter of wood or any other foreign body imbedded in any fleshy part he begins to experience pain at the part, and this is soon succeeded by redness of the skin. In its early stages the process is known as irritation; but soon, if the foreign body be not removed, the pain and redness increase, and are accompanied by a firm and extremely tender swelling at and around the spot, and a sense of abnormal heat. These purely local symptoms are succeeded, if the inflammation reach a certain degree of intensity, by a general derangement of the vascular and nervous systems, to which various names, such as constitutional disturbance, symptomatic or inflammatory fever, &c., have been applied.

Numerous observers have attempted to trace the exact phenomena of inflammation, by microscopic examination of the transparent parts of animals in which the process has been artificially excited. From observation made on the web of the frog's foot and other transparent parts of animals by Wharton Jones, Paget, Cohnheim, Burdon Sanderson, Ziegler, and many others, the main features of the process are now well known.

In inflammation of moderate severity the blood-vessels of the part are seen to dilate, and the current of blood through them, at first sometimes a little accelerated, becomes much slower than the normal. In consequence of this retardation the white blood-corpuscles, being somewhat sticky in consistence, fall out of the central stream, and drag along the sides of the vessel, where, as the inflammation increases, they are arrested. Then follows the most remarkable part of the process. Minute buds are seen to form on the outside of the walls of the veins and capillaries, each one corresponding to a white blood-corpuscle in the interior. These buds grow larger at the expense of the corpuscles, which thus pass through the wall of the vessel without any break in its continuity; and the migration continues till the tissue around the vessels is crowded with corpuscles. At the same time an abnormal quantity of fluid exudes through the walls of the blood-vessels, and in part coagulates, forming with the corpuscles what is known as coagulable or plastic lymph. From the capillaries red as well as white blood-corpuscles pass into the tissues. If the inflammation be more intense complete arrest of the flow of blood in the vessels (stasis) takes place.

We may now consider the explanation of the cardinal symptoms of inflammation. The *redness* depends upon there being more blood than usual in the blood-vessels of the affected part; sometimes also upon the occurrence of hemorrhage in the inflamed tissue. The *swelling* depends in part upon the distension of the blood-vessels, but mainly upon the effusion of fluids and blood-corpuscles above described. These are termed the *products* of inflammation; and many changes, some of a reparative nature and others of an injurious tendency, depend upon their presence. The *pain* may vary from mere discomfort to intense agony. It is probably due to compression of the sensory nerves of the affected part by the dilated vessels, and the exudation. It is often throbbing. There is usually most pain in those parts in which the tension produced by the swelling is the greatest, as in bone, serous and fibrous membranes, &c. The pain occurring in inflammation is always aggravated by pressure, and by this means the physician can often distinguish between inflammatory and non-inflammatory disorders. The *heat* is seldom so much increased as the sensations of the patient would lead him to believe; it does not rise above the maximum heat of the blood in the interior of the body. This increase of heat depends upon the increased flow of arterial (or highly oxidised) blood to the part.

The blood obtained by bleeding a patient suffering from inflammation of any important organ usually presents a peculiar appearance after coagulation known as the *buffy coat* (see BLOOD). Another and a more important change in the blood in inflammation is the augmentation of the fibrin, which often rises to two, three, or more times its normal quantity.

The further course of inflammation is much more variable. The most favourable termination is *resolution*, where the products of the inflammation are gradually removed by the lymphatics, and the tissue returns to its normal state. If the exuded blood-corpuscles accumulate in large amount (*suppuration*) they form an Abscess (q.v.), and must in general be evacuated before cure can take place. If the inflamed tissue be superficial its outer layers may die and be thrown off (*ulceration*), leaving a sore which heals by Cicatrisation (q.v.). If the inflammation be severe and extensive Gangrene (q.v.) or *mortification* may ensue.

In the return to health of inflamed tissues, where neither resolution nor death of the patient has taken place, formation of new tissue is necessary to fill up the gap which is left by suppuration or ulceration. This is effected mainly by the action of the exuded leucocytes present in the 'plastic lymph,' which under suitable conditions becomes gradually organised into fibrous tissue, bone, &c.; but the restoration of the epithelial covering, where a breach in the surface either of skin or mucous membrane has occurred, is effected only under the influence of epithelial cells present at the edge of the gap. The process is essentially similar to the healthy repair of broken bones (see FRACTURE), or incised wounds, though many authorities do not apply the term inflammation to these cases. It is thus that parts recently severed from the body may be sometimes replaced and still live. The success of the Taliacotian operation, by which a new nose is engrafted in the position of that which had been lost, of the operation of injecting a stimulating fluid into cystic tumours, with the view of setting up adhesive inflammation, and of various other surgical operations, essentially depends upon the property of organisation possessed by inflammatory exudation, or closely allied products. Although the organisation of plastic lymph is thus essentially a conservative and reparative process, it leads in many cases to untoward results. Thus, when a serous membrane (e.g. pleura, pericardium, peritoneum) is inflamed, the exudation between its contiguous surfaces often becomes transformed by the same process into fibrous tissue, forming layers or bands which seriously interfere with the functions of the organs involved (lung, heart, intestine, as the case may be) after the inflammation has subsided. In inflammation of the iris the pupil may be rendered irregular or immovable, or may even be closed up by inflammatory exudation. In endocarditis, or inflammation of the lining membrane of the heart, exudation may be deposited in wart-like masses on the valves, and may thus occasion some of the worst forms of cardiac disease.

The causes of inflammation are very various. Among predisposing causes must be reckoned any condition which lowers the vitality of the whole body, or of any particular part of it. The most obvious exciting causes are mechanical violence, chemical irritants, excessive heat or cold, producing injury of a part of the body which leads directly to inflammation in that part. Less obvious, but not less certain, is the effect of exposure to cold in exciting inflammation of internal organs. But of all the causes the most important undoubtedly, though they have only been recognised within the last three decades of the 19th century, are micro-organisms—bacteria, &c. (see GERM). Besides the numerous *specific* diseases attended by inflammation of various organs and tissues proved or believed to be due to these bodies, many forms of what is known as *simple* inflammation—e.g. acute abscess—have been shown to be associated with them. Some authorities go so far as to say that *no true inflammation can take place without them*; and though this opinion has not been proved, it is certain that almost all the most severe forms of inflammation are characterised by the presen
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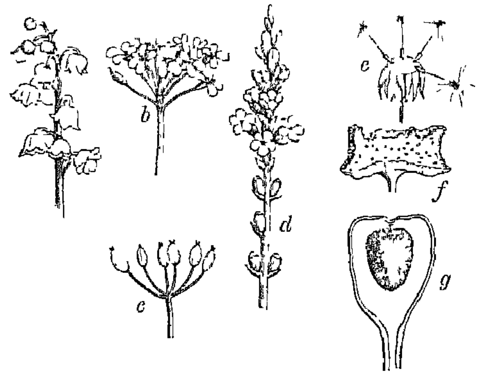
setons, &c., are often of service.

**Inflection.** See GRAMMAR.

**Inflorescence.** This term is applied by botanists in a concrete and special, as well as in an abstract and general sense—i.e. first to any single group or natural aggregate of flowers arising upon a common main axis, and secondly to the various modes or principles of floral arrangement themselves. Despite that endless superficial diversity upon which the characteristic aspect of different species and larger groups so much depends, these apparently indefinite variations may readily be reduced to a small number of easily intelligible types. For, while the earlier botanists naturally tended to develop a nomenclature corresponding to the multiplicity of outward forms which inflorescences acquire, the progress of research has simplified this by centering attention upon the few and simple modes of branching by which they arise. We naturally set out with any plant of which the axis continues to grow indefinitely, but of which a number of secondary axes arising in the axils of the leaves are developed as flowers. When the pedicels of these flowers tend to reach a moderately equal length the inflorescence is known as a *raceme* (fig. 1, *a*); or when the process of floral development arrests them, so that the flowers are practically sessile, we have a spike (fig. 1, *d*). The growing point of most racemes and spikes, however, tends to be checked by the reproductive stress, and the axis thus frequently ends, or rather seems to end, in a terminal flower. Good examples of this essentially racemose or spicate type are furnished by many Liliaceæ, Scrophulariaceæ, &c.—



'g. 1.

onvallaria); *b*, corymb of candy-
uits of fennel (Fœniculum); *d*,
*e*, head of fruits of dandelion
fig (Ficus) in vertical section.

llein, &c. Even such a
t of the pine-apple may
as a greatly condensed
by its leafy growing

n axis of a raceme may
evelopment has begun,
are much less developed
e pedicels of the younger
e same arrest of develop-
t the comparatively long
wers place them on much
higher ones, and even as
. This variety is known
, so familiar in the candy-
internodes are so shortened
ise from practically the same
nbel (fig. 1, *c*), so characteristic

getative arrestment and floral
ntinued still further, internodes
e become arrested, and the result
ie or excessively shortened spike
s. By continuing the same process which gave us the corymb, the cone necessarily tends to appear more and more depressed through the more rapid upgrowth of its lower portions; thus we have that characteristically expanded axis, so compactly set with florets as to resemble at first sight a single flower, familiarly known as the head or capitulum of the Composites (fig. 1, *e*). The spiral arrangement of the florets so obvious in a sunflower is simply that of the depressed cone, which we may again draw out in imagination into the corymb, the spike, or the raceme, with which it is in principle identical.

A capitulum fundamentally similar may, however, be evolved in a slightly different way, by the more or less complete arrestment of the secondary axes of an umbel. Hence it is that a few umbelliferous plants, like Astrantia, or still better the sea-holly (Eryngium), &c., come to present that appearance which so often induces the beginner to confuse them with Composites.

But, since it is manifest that the same embryonic shortening may occur in any type of inflorescence whatsoever, it becomes evident that we must reserve the term capitulum for the type of inflorescence presented by the Composite or Scabious, leaving the various superficially resemblant forms or *pseudo-capitula*, as of sea-holly already referred to, or those of sea-pink, of bergamot, &c., to be separately analysed according to their true origin.

Returning, then, to the capitulum proper, we must continue to keep clearly in view that conception of vegetative growth (as reaching its maximum rate only at some distance behind the growing point) which may be actually verified by measurements of any growing shoot or root. The conical axis thus not only tends to broaden and flatten, but its lower portion must at length overtake the apex, and a perfectly flat receptacle, as in some species of Dorstenia, results. The margins next outgrow the apex, and the cone is now becoming a shallow saucer (other species of Dorstenia, fig. 1, *f*). The saucer next becomes a cup, or even flask; and the remarkable hollow inflorescence of the fig (fig. 1, *g*) is thus seen to be morphologically akin to the capitulum, and through this by the corymb even to the original raceme itself.

The study of vegetative branching (see **Branch**) has, however, shown us that we may have to do with compound or sympodial axes as well as simple or monopodial ones. That is to say, in our primary axis the growing point may perish, leaving, however, of course, all the more opportunity for the development of the secondary axes latent in its lateral buds. This disappearance of the primary growing point, having once set in, soon works back, until we have it occurring immediately after the development of the first lateral bud. This then readily takes its place for practical purposes, just as a larch or pine which has lost its top renews it by the upgrowth of a branch. But the new axis dies in turn after giving birth to its successor, and so on; thus the *false axis* or *sympode* is formed. Inflorescences of this type are known as *cymes*. The simplest in principle is that of the Day-lily (q.v.). It is commonly known as the *helicoid cyme* (fig. 2, *h*), since the origin of the new axes winds on in the same spiral order as that of the leaves upon the primary axis itself. The distinction from a raceme is, however, easily made when we notice that the so-called bracts are not really bracts at all, but are more or less opposite to the flowers; being really only the axillant leaves of the next axis, which bears its flower only after producing a leaf with the bud of its successor.

But in other cases the spiral may change its direction with each new axis, and the false axis thus assumes a very different appearance, that of the *scorpioid cyme* (fig. 2, *i*), of which the classical example is furnished by the Boraginaceæ (Goebel, however, regards these as unilateral racemes, and offers Tradescantia, Echeveria, &c. as more real types). This reversal of the spiral has been prettily verified by noting how in the scorpioid cyme of the

Rock-rose (Helianthemum) the spiral of the calyx runs in an opposite direction in each successive flower.

So far we have been dealing with cymose inflorescences as arising in plants with alternate leaves: in opposite-leaved plants—e.g. Caryophyllaceæ and Begonia (q.v.)—the resultant form is necessarily very different. Let the growing point terminate in a flower as before; but since each of the two leaves immediately below is in an equally favourable condition, both as regards radiation and aliment, we have *two* secondary axes instead of *one*. Hence, instead of one secondary axis continuing in the line of the primary one, we have necessarily two of equal strength and divergent at an equal angle. The main axis thus at first sight

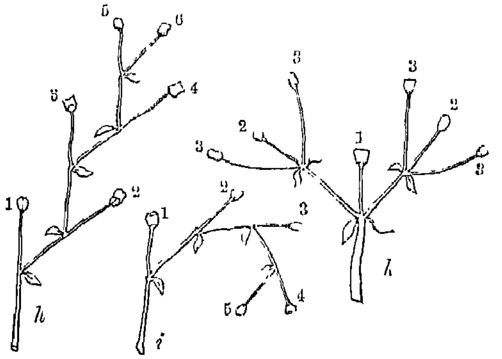


Fig. 2.

Diagrammatic representation of *h*, helicoid cyme; *i*, scorpioid cyme; *k*, dichasium.

seems to have forked, especially when the terminal flower disappears, just as in the *false dichotomy* so apparent in the branches of the lilac or mistletoe; and hence the old name of *dichotomous cyme*, which, however, it is evidently necessary to correct, as *dichasium* (fig. 2, *k*), *biparous cyme*, or the like.

This inflorescence may undergo shortening, or in more physiological language remain more or less embryonic, as in most Labiatæ (which, however, present all *gradations, from* the fully-developed cymes of Hyssopus, through the 'false whorls' or 'verticillasters' of the majority of genera, to the terminal pseudo-capitulum of Bergamot). The apparent umbel of geraniums and the pseudo-capitulum of the sea-pink have also this origin.

Not only modifications of these leading types, but various combinations, simple, compound, and complex, *and in all degrees of reduction or exuberance*, may also arise; the question of separating all the preceding types of inflorescence as *radial* from a small residuum as *dorsi-ventral* also presents itself. See Goebel's *Outlines of Classification* and Van Tieghem's *Traité de Botanique*.

**Influenza** (Ital., 'influence;' called in French *la grippe*), one of the class of diseases to which the term Zymotic (q.v.) is now applied, has been long recognised by medical writers. The popular application of the name to any severe cold in the head is not sanctioned by medical authority. Cullen called it *catarrhus e contagio*, but although, in most cases, it closely resembles ordinary catarrh, it presents certain points of difference from that disease. In addition to the ordinary symptoms of catarrh, there is a sudden, early, and very striking debility and depression of spirits. This early debility is one of the most marked and characteristic signs of influenza. The mucous membranes (especially those of the respiratory organs) are much affected. The tongue is white and creamy, the sense of taste is lost, there is no appetite, the pulse is soft and weak, the skin, although at first hot and dry, soon becomes moist, and the patient complains of pains and soreness in various parts of the body.

In simple, uncomplicated cases convalescence supervenes in the course of a week or sooner; but influenza is very frequently conjoined with bronchitis or pneumonia, in which case it is much more persistent and dangerous. There is, moreover, an extreme proneness to relapse on the slightest exposure, even after the patient feels perfectly recovered.

Influenza affords an excellent example of an epidemic disease, a whole community being often attacked in the course of a few hours. From this it may be inferred that the occurrence of this disease is connected with some particular condition of the atmosphere, but what that condition is is not known. Not unfrequently influenza follows close *upon a sudden thaw*; *sometimes it is* preceded by thick, ill-smelling fogs; but hot and cold, wet and dry weather have all been attended by severe outbreaks of the disease. Like cholera, influenza *generally, but by no means constantly, follows* a westerly direction, or one from the south-east towards the north-west, and its course seems to be altogether independent of the surface currents of *air, as it often travels against the prevailing wind.*

The epidemic which prevailed during the winter of 1889-90 in most parts of the civilised world, the first of importance in Britain for nearly forty years, presented *some* points of difference from most of the previously recorded outbreaks. In particular, there was in many places a much larger proportion of cases without any catarrhal
symptoms whatever than appears to have
observed before. Such cases present a clos
semblance to Dengue (q.v.), and many obs
have come to the conclusion that ther
*much closer relation between the two disea*
has been hitherto supposed; while som
that the epidemic in question was it
modified by climate, and not influen

The most important point in
influenza is *not* to bleed the pat
to depress his vital powers.
in bed; his bowels should be
skin slightly acted upon, if d
be troublesome, a mustar
applied to the chest, and a
prescribed. Antipyrin and
the epidemic of 1889-90
combating the feverishn
stage. In persons of
stitutions, ammonia, b
must be given from t
often remains for a
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Few diseases in
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**In Forma**
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in former times only to the rather uncomfortable alternative of choosing between paying and being whipped. This indulgence, first confined to plaintiffs, was afterwards extended to defendants. It was at first restricted to the Common Law Courts, but afterwards adopted in the practice of the Equity and Probate and Divorce Courts. No one can sue *in forma pauperis* unless the opinion of counsel on his case, and an affidavit by the party or his solicitor that the same case contains a full statement of the material facts, be produced to the court applied to. A suitor *in forma pauperis* is not entitled to costs unless by order of the court. In Scotland an Act of 1424 established the poor's roll to secure a like privilege to poor persons there.

**Information.** See Criminal Law.

**Informer,** in English law, the person who sues for a penalty under some statute. In many statutes which define offences—not criminal, but savouring of criminality—encouragement is often given to persons who are willing to sue on behalf of the crown, the pecuniary penalty or part of it being given to the informer. This kind of action is called a *qui tam* action, from the use of the words *qui tam pro dominâ reginâ quam pro seipso,* &c. In criminal proceedings an accomplice who turns king's evidence, if accepted as a witness by the crown, is called an approver or prover. Ever since the days of the professional 'Sycophant' (q.v.) at Athens the informer has been regarded as an odious character. In Ireland, owing to the unsatisfactory relations between the government and the people, almost any person who gives evidence against a prisoner runs the risk of making himself
oular. In Chancery proceedings at the suit
attorney-general the informer is called a
In Scotland an informer is the party who
ord Advocate in motion in criminal pro-
nd the Lord Advocate is bound to give
of the informer, who is liable in case
secutions. See Approver, Spy.

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cy differ from decoctions, in
ich boiling is resorted to.
by digesting the vegetable
c.) in hot or cold water in
essel. Cold water is pre-
principle is very volatile,
void the solution of some
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cold water is preferable,
bitter principle (which is
), and leaves the starch-
n most cases, however,
oyed. Infusions are pre-
when the active principle
ng heat, as in the case of
en ebullition readily induces
ge, as in the case of senna.
also be prepared by Percolation
which is extensively employed in
of tinctures. When thus prepared
le to decay than when prepared on

infusion, while possessing a finer
in danger of being superseded in
ical practice by the concentrated in-
On account of the trouble and expense
in making small quantities of the fresh
tions, recourse is frequently had to the con-
ed ones, which, when diluted with seven
heir bulk of distilled water, more or less
nt the fresh article. Where the active prin-
a volatile one it is very difficult to retain
l aroma in the concentrated state, and to this question much pharmaceutical attention has been turned. The concentrated infusions contain from 20 to 25 per cent. of alcohol, which is essential for their preservation. The simple infusions may be preserved for a short time by the addition of a trace of chloroform.

**Infusoria,** a name given to several classes of active Protozoa, some of which appear in great numbers in stagnant *infusions* of animal or vegetable matter. The great majority are provided with vibratile locomotor processes of their living matter, usually in the form of cilia or flagella; and, though these may be retracted when the animal occasionally encysts itself, they are practically permanent, and express the predominantly active constitution of these cells. Most are microscopic, but many are readily seen when foul water is held in a glass vessel between the eye and the light. Yet there may be more Infusorians in a cup of stagnant water than there are people on the globe. Infusorians occur both in fresh and salt water, and a few are parasitic; they feed on vegetable or on animal matter, on bacteria or on one another, while some possessed of a green pigment, closely allied to, if not identical with chlorophyll, probably absorb carbonic dioxide after the manner of plants. Most Infusorians possess a 'mouth'—i.e. a special aperture through which the food-particles are wafted in by the cilia or flagella. As single cells, comparable to the units of ciliated epithelium in multicellular animals, to the active spores of plants, and to male cells or spermatozoa, they exhibit the usual protoplasmic structure and the central differentiation or nucleus. There is usually a definite rind, often with cuticular structures; and there are generally contractile vacuoles, probably excretory in function. Many Infusorians occur not as single individuals, but as members of a colony, the results of multiplication remaining clubbed together, and often forming masses easily visible to the unaided eye. They multiply with great rapidity by dividing into two, or by rapid successive division into a larger number (spore-formation); and thus a single Infusorian, with favourable temperature and nutrition, may in four days become the ancestor of a progeny of a million, in six days of a billion, in seven and a half days of a hundred billions—weighing one hundred kilogrammes! If the life of the species, however, is to be sustained, conjugation or incipiently sexual union of two Infusorians (not of the same family) must occur, for if the descendants of one individual be left by themselves the whole family falls victim to 'senile degeneration,' and the members dwindle away. In many cases among ciliated Infusorians the researches of Maupas and others have shown that the conjugation of two forms means an interchange of nuclear elements; in other cases the two individuals fuse into one. When the two conjugates are of unequal size, as in the common Vorticella or bell-animalcule, it seems justifiable to call the smaller male and the larger female.

The classes included under the title of Infusorians are as follows, beginning with those ciliated forms to which zoologists often restrict the term.

*Ciliata.*—Infusorians characterised by the predominance of alternately bent and straightened motile processes known as cilia. The usual nucleus is accompanied by a second neighbour nucleus (para- or micro-nucleus), the elements of which are interchanged in conjugation. They are classified according to the relative position and size of their cilia. The slipper-animalcule (Paramæcium), and Opalina parasitic in the intestine of the frog illustrate those which are more or less completely ciliated (Holotricha); the beautifully-coloured species of Stentor, the genus Balantidium, with one species parasitic in man, and the common Bursaria are among those with heterogeneous cilia dissimilar in size and form (Heterotricha); the stalked bell-animalcule Vorticella and its beautiful allies Epistylis and Carchesium, the jumping Halteria, with a girdle of springy, bristle-like processes, and Ophrydium, which multiplies into large hollow colonies, sometimes 5 inches across, have a special wreath of cilia round the mouth (Peritricha); and lastly, those with cilia restricted to the under surface are well illustrated by Euplotes, Oxytricha, and Stylonichia.

*Flagellata.*—Infusorians with a vibratile or undulatory flagellum, or with more than one, used for locomotor or food-catching purposes, including a vast number of forms, some of which are often called Monads, while others—e.g. Volvox—approach if they do not unite with the Algæ. One of the very commonest flagellate genera is Euglena. To the flagellates proper there have to be added the Choanoflagellata, with a single flagellum surrounded by a beautiful wine-glass-like collar—e.g. Salpingœca, and the interesting Proterospongia—a colony with slight division of labour among its members and like a little fragment of sponge flesh; also the Dinoflagellata, with two flagella, one parallel, the other transverse to the long axis of the body—e.g. Peridinium, an extremely common marine form, affording food to some fishes; lastly, the Rhynchoflagellata, with a large locomotor flagellum, including two genera—the phosphorescent marine 'night-light' (Noctiluca), and Leptodiscus, a beautiful bell-like form, which seems within the compass of a single cell like a far-off prophecy of medusoid architecture.

*Suctoria* or *Acinetaria.*—Infusorians with cilia only in their free-living youth, usually fixed as adults, and always with prehensile or suctorial processes like tentacles, by means of which they prey upon other Protozoa. Acineta and Podophrya are suctorial; the common Acineta is only prehensile.

In beauty of form and movement, in the liveliness of their behaviour, and in the intricate phases of their life-history, Infusorians afford almost inexhaustible material for investigation, which many workers have shown to be at once captivating in itself and full of biological suggestiveness. In the general economy of nature Infusoria are especially important as a food-supply to small animals, and in so far as they unite with Bacteria in working decaying matter once more into the cycle of life, or in reducing it to simpler elements.

See BACTERIA, MONAD, PARAMÆCIUM, PROTOZOA, VORTICELLA; Claparède and Lachmann, *Études sur les Infusoires* (Geneva, 1858-61); Stein, *Organismus der Infusions-Thiere* (Leip. 1859-83); Saville Kent, *Manual of the Infusoria* (Lond. 1880-82); Ray Lankester, article 'Protozoa,' *Encycl. Brit.* (1885); Maupas, *Archiv. Zool. Expér.* (vi. 1888); Bütschli, 'Protozoa,' in Bronn's *Thierreich.*

**Infusorial Earth,** DIATOM EARTH, KIESELGUHR, a siliceous deposit formed chiefly of the frustules of Diatoms (q.v.). It is used as *Tripoli Powder* for polishing purposes, and as an absorbent of nitro-glycerine in making Dynamite (q.v.).

**Ingelow,** JEAN, a popular poetess and novelist, was born at Boston, Lincolnshire, in 1820. Her first efforts in verse were published anonymously in 1850 under the title of *A Rhyming Chronicle of Incidents and Feelings.* These gave indication of considerable power, as well as of the influence of Tennyson and Mrs Browning, to whose writings she appears to have been strongly drawn in youth. A good deal of Miss Ingelow's poetry is of a devotional or religious cast, introspective in quality and melodious in style. But she has also written some powerful ballads, and of her minor pieces *The High-tide on the Coast of Lincolnshire, 1571,* is probably both the finest and the best known. Of her larger poems *A Story of Doom* (1867) has been the most successful. To about the same time belong *Deborah's Book and the Lonely Rock, Grandmother's Shoe, The Suspicious Jackdaw, The Life of John Smith, The Minnows with Silver Tails, Studies for Stories.* A collection of Miss Ingelow's poems, in two volumes, was published in 1880. Among her novels may be specially mentioned *Off the Skelligs,* a very fine work; *Fated to be Free* (1875); *Don John* (1876); and *Sarah de Berenger* (1880). In 1887 a third volume of her poems appeared.

**Ingemann,** BERNHARD SEVERIN, long the most popular of the poets and novelists of Denmark, was born May 28, 1789, at Thorkildstrup, in the island of Falster. A very prolific writer of the sentimental school, Ingemann began his literary career by publishing some volumes of lyrics (as *Procne,* &c.). Then he was extremely successful with several collections of *Fairy-tales and Stories.* But his best works were a series of historical novels, in which he took Walter Scott for his model—*Valdemar Seier* (1826), *Erik Menved's Childhood* (1828), *King Erik* (1833), and *Prince Otto of Denmark* (1835). The poems *Waldemar the Great and his Men* (1824), *Queen Margaret* (1836), and *Holger Danske* (1837), which are based, like his novels, on incidents of Danish national history and tradition, rank among Ingemann's most successful efforts. Besides being prolific he was also versatile, and essayed his hand in nearly all branches of pure literature, not the least estimable of his productions being *Psalms* (1825). From 1822 he taught Danish language and literature in the Royal Academy of Sorö, near Copenhagen. His collective works were published in 39 vols. (
64). He died 24th February 1862. Two aut
graphical works from his pen appeared in 186

**Ingermanland.** See ST PETERSBURG

**Ingersoll,** JARED, an American jurist,
*Connecticut* in 17
and Paris, and
Philadelphia.
1780-81, was in
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**Ingersoll,**
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**Ingleby,**
Shakespearian
Birmingham,
privately, and
College, Camb

1847, and became M.A. in 1850, and LL.D. in 1859. He entered his father's office as a solicitor, and practised for a short time, though by no means assiduously or *con amore;* and after his father's death in 1859 relinquished the profession altogether to devote himself to a busy life of letters. He was one of the two English honorary members of the Weimar Shakespeare Society, an original trustee of Shakespeare's birthplace, a vice-president of the New Shakespeare Society (a post he afterwards resigned), and successively foreign correspondent and vice-president of the Royal Society of Literature. He died 26th September 1886.

His earliest work, *Outlines of Theoretical Logic* (1856), was followed by *An Introduction to Metaphysic* (1864–69) and *The Revival of Philosophy at Cambridge* (1870). But the most important work of his literary life began when he published *The Shakspeare Fabrications* (1859) and *A Complete View of the Shakespeare Controversy* (1861). These were followed by *Was Thomas Lodge an Actor?* (1868); *The Still Lion* (1874), enlarged into *Shakespeare Hermeneutics* (1875); *The Centurie of Prayse* (1874); *Shakespeare: the Man and the Book* (1877–81); *Shakespeare's Bones* (1883); *Shakespeare and the Enclosure of Common Fields at Welcombe* (1885); and an edition of *Cymbeline* (1886). A selection of admirable *Essays* on a wide range of subjects was issued in 1888 by his son, Holcombe Ingleby, who prepared in the same year, for private circulation, a brief memoir of his father, with a collection of his epigrams, translations, and verses.

**Ingoldsby,** THOMAS. See BARHAM.

**Ingolstadt** (called *Aureatum* and *Chrysopolis*—i.e. 'the golden city'), a town and first-class
tress of Bavaria, on the left bank of the Danube,
miles by rail N. of Munich. It contains two
s of the former dukes of Bavaria-Ingolstadt
for military purposes); the Gothic church
dy (1425), in which is the tomb of Eck,
ponent; and the former Jesuit college.
nnon-founding, and the manufacture
and salt are the only industries.
'74; (1885) 16,390, mostly Roman
sity was founded here in 1472,
n and other eminent scholars
d a century after its founda-
It was removed to Lands-
ich twenty-six years later.
erman town at which the
to establish themselves,
m the university chairs.
title of 'his little Ben-
n Weishaupt established
golstadt, which existed in
st fortified in 1539. In
hich had been destroyed
ere restored upon a first-
by Gerstner (1853) and

H HOLT, author of *The*
*avid,* was born at Portland,
or some time a sailor, and
uages at a college in Missis-
a string of wild romances,
*d* and *Lafitte, or the Pirate of*
he was ordained to the Episco-
55, he chose biblical subjects for
rote *The Prince of the House of*
*he Pillar of Fire* (1859), and *The*
(1860). He died in 1860.

N DOMINIQUE AUGUSTE, French
n at Montauban, 15th September
e a pupil of David in 1796, and
gained the 'Grand Prix.' In 1806
Rome, where he resided for four-
then spent four years in Florence,
ed 'The Vow of Louis XIII.,' a
on being exhibited at the Paris
Academy in 1824, broke down the indifference of the public to the work of Ingres. In Italy he had adhered to the style of David, but had modified it by the inspiration he got from Raphael and other old masters. To this period belong his best portraits, and his 'Œdipus and the Sphinx,' 'Venus Anadyomene,' 'Romulus and Acron,' 'Virgil reading the *Æneid,*' 'Raphael and Fornarina,' 'Roger and Angelique.' Returning to Paris in 1826, Ingres was appointed professor of Fine Arts at the Academy, and became the recognised head of a great school. But the acrimonious criticisms passed upon his 'Apotheosis of Homer' (1827) and 'Martyrdom of St Symphorian' (1834) made him gladly embrace the opportunity of succeeding Horace Vernet as director of the French Academy in Rome in 1834. There he painted 'Stratonice' and the 'Portrait of Cherubini.' The exhibition of these and other pictures in Paris at length turned the tide of popular admiration full and strong in his favour. He relied more upon form and line than upon colour; some of his best productions ('Girl after Bathing,' 'Œdipus and the Sphinx,' the 'Odalisque,' and the 'Fountain'), compositions of a few figures each, are unquestionably deserving of admiration; but of late it is commonly held that for a time he was unduly overrated. At the exhibition of 1855 he was awarded the grand medal of honour for his collection of pictures, and was nominated a grand officer of the Legion of Honour. He returned to Paris in 1841, and died there on 14th January 1867. See Lives by Delaborde (1870), Blanc (1870), and Schmarsow (1884; in Dohme's *Kunst und Kunstler*).

**Ingria.** See ST PETERSBURG.

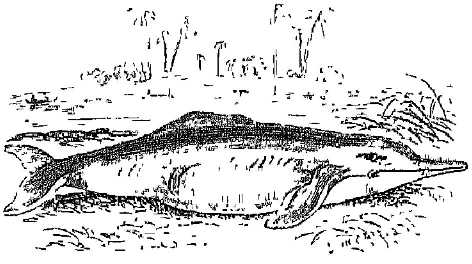
**Ingrossing.** See ENGROSSING.

**Ingulph,** abbot of Crowland, long considered the author of the *Historia Monasterii Croylandensis,* according to Ordericus Vitalis, was secretary to Duke William of Normandy, and was by him in 1085 made abbot of Crowland, where he died in December 1109. The *Historia Monasterii Croylandensis* was printed by Sir Henry Savile in his *Scriptores Rerum Anglicarum post Bedam* (1596), and in a more complete edition, with the continuation by Peter of Blois, in vol. i. of the *Rerum Anglicarum scriptores veteres* (Oxford, 1684). There is a translation by H. T. Riley in Bohn's Antiquarian Library (1854). Some writers even of the 18th century questioned the entire genuineness of the book; but their scepticism did not proceed further than the hypothesis of interpolations by a later writer. But in 1826, in the *Quarterly Review,* Sir Francis Palgrave endeavoured to prove that the whole so-called History was little better than a novel, and was probably the composition of a monk in the 13th or 14th century. This has been conclusively proved, as the student will find, by Mr Riley in the *Archæological Journal* (vols. i. and ii.), and by Sir T. D. Hardy in the *Descriptive Catalogue* (vol. ii.).

**Inhambane,** a Portuguese station, capital of a district on the east coast of Africa, lies just south of the tropic of Capricorn, and is beautifully situated on its bay, but unhealthy. The town dates from 1764, and has 6500 inhabitants, of whom some 70 only are Europeans.

**Inheritance.** See HEIR, INTESTACY, WILL, SUCCESSION, HEREDITY.

**Inia** (*Inia geoffrensis*), a toothed fresh-water Cetacean, not unlike a dolphin, but with certain anatomical peculiarities which keep it outside that family. It is found in some of the upper tributaries of the Amazons, and in the lakes near the Cordilleras. It measures about 8 feet in length, has a long cylindrical snout with stiff hairs, and a very slight dorsal fin. It feeds chiefly on fish, and is hunted for the sake of the oil which it yields. It is generally found in little troops of three or four. The females show great affection for their young.



Inia.

**Initials.** Though in general it is usual and regular in all legal deeds and writings for a party to write his ordinary signature in full, yet in many cases, especially in documents of a mercantile nature, signature by initials will bind equally with the full signature. If, however, the subscription to a bill of exchange be by initials or marks it will not warrant summary execution; and the pursuer of an action on the bill will have to prove that such initials or marks are the party's usual mode of subscribing.

**Injections.** This term is applied in medicine to fluids thrown into the passages or cavities of the body by means of a syringe or elastic bag. The fluids thus injected into the *rectum* or lower bowel are termed Clysters (q.v.). Hypodermic Injections are treated under that head. See also TRANSFUSION OF BLOOD.

**Injector.** Fig. 1 shows in section a simple form of injector for raising water. Steam issuing from the pipe S, into the vessel WR, will first create a partial vacuum above W by dragging air with it, and then, when the water-level is above the nozzle, will, on collapsing by condensation, impart its energy to the water and drive it up through the narrow neck below R, to a height of about one foot for every pound of steam-pressure per square inch. It is doubtful whether these injectors can work so economically, as regards expenditure of steam, as ordinary slow-moving pumps do; but they possess many conveniences and advantages which are bringing them into use.

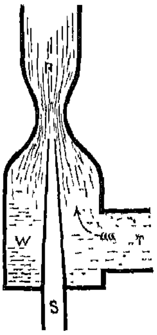


Fig. 1.

Feed-pumps, for feeding water into steam-boilers, are difficult to keep in order when driven at high speed. The very rapid action of the valves severely tries their durability. In the case of locomotives inconvenience was often occasioned by the fact that their feed-pumps acted only when they were running; and thus, if an engine happened to stand still for any length of time, the water occasionally got too low in the boiler. M. Henri Giffard's injector, now in general use in place of high-speed feed-pumps, acts equally well whether the engine is running or at rest.

The diagram fig. 2 will give an idea of the essential parts of Giffard's injector. A is the steam-boiler, B the water-level, CDF a pipe into which steam is admitted: this pipe terminates in a cone DF, which is enclosed in a larger cone HH. In the cone DF the pointed plug E can be raised or lowered so as to increase or diminish the area of the aperture at its lower end F. G is a pipe communicating with the water-cistern, and admitting water into the external cone HH. K is a pipe communicating with the boiler under the water-level. On opening communications between the boiler and this apparatus it might be expected that steam would rush out at F, and water at K, both currents meeting with great force, and escaping into the atmosphere between the two openings. Paradoxical as it may appear, the water at K, although it is actually, by reason of the *head* of water arising from the difference of level between the aperture at K and the water-level at B, subject to a *greater* boiler-pressure than is the steam in the cone DF, is yet overpowered, and driven back into the boiler by the stream of water and condensed steam issuing from H; and thus water, from the pipe G and the tender or cistern, is introduced into the boi constitutes the feed-water. The energy of lapsing steam at F is transferred to wat this is driven forward in a stream, narrowest at K; in this stream t per unit of bulk at K thus co potential energy of the boiler- actual velocity to exceed the outflow from K; whence the overpowered. In practice th what expensive apparatus i number of adjustable parts, in the pressure of steam re area of the steam-passage, a tween the mouths of the co outflow and inflow of steam a

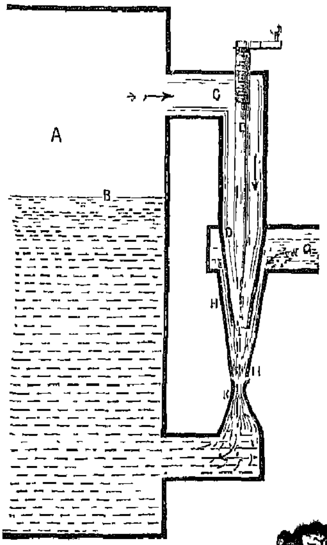


Fig. 2.

**Injunction,** in English l writ, by which a superior co some inequitable or illegal act party disobeys the injunction h for contempt of court, and impri In Scotland a remedy of a simila Interdict (q.v.).

**Ink** is a general term for any which, when applied to a suitable upon it a partially or wholly indelib Any such fluid may be used for writ but, as the recording material is ge this fluid must have either an affinity for matter of which the paper is made, or for material used to produce upon it a ho surface. This is necessary to prevent of the ink by water; and this power of itself is one of special importance, depend the permanency and indeli records. Certain salts have this prop salts of iron, which when exposed oxygen, the result of which is th green solution produced by mixing protosalts of iron with vegetable matters containing tannic or gallic acid is converted into a dense blue-black insoluble compound, which cannot be removed from the paper unless it is tampered with by means of chemicals capable of decomposing or destroying it. It is owing to the formation of this insoluble compound that writing-ink, when left in open vessels exposed to the air, becomes thick and ropy, and unfit for use. Other black inks are prepared from salts of chromium and vanadium. These inks are in some cases more suitable than the simple writing-inks described above. Sulphate of indigo is also used as a colouring matter. A black ink which lays claim to indelibility is prepared from nigrosine, one of the aniline compounds; but the colour is much inferior to that of ordinary inks, and is not absorbed by the paper fibre to the same extent. Writing-inks are generally acid in character, which causes the corrosion on metal pens; but this property rather tends to enhance the value of the ink, as it retards the bleaching action noticeable in old documents. Creasote, or common wood vinegar, is added to most inks to prevent moulding.

The following will be found excellent recipes for the manufacture of black writing-ink on a small scale: '*With galls and sulphate of iron.*—1 lb. bruised galls, 7 gal. boiling water, 5½ oz. of sulphate of iron (copperas) in solution, 3 oz. gum-arabic, previously dissolved, and a few drops of an antiseptic, such as carbolic acid. Macerate the galls for twenty-four hours, strain the infusion, and add the other ingredients. *With Logwood.*—Boil 10 oz. logwood in 20 oz. of water; boil again in 20 oz. more water,
mix the two decoctions; add 2 oz. chrome alum,
again for quarter of an hour; and 1 oz.
ic. The product is 25 oz. deep black ink.'
-inks are prepared by adding sugar, gum,
to ordinary writing-inks. These sub-
ect the colouring matter (combined
from the oxidising influences of
a skin or impervious varnish
hus, when the damp 'tissue'
riting, sufficient unoxidised
in the paper from back to
ible copy on the upper side.
d in water holding gum or
lso used as copying fluids.
colouring power these inks
opies from one document
for temporary use, as on
these colours quickly fade,
Copyable printing-ink is
erials; and, when written
be copied, as on way-bills
great convenience. Copy-
from the same materials
t there is a very serious
of such inks and pencils:
en matter can be entirely
alcohol or other solvents.

ve been made to produce writ-
ald hinder or render impossible
cuments, but without much suc-
sity for such inks seems exag-
s been found that even with the
ve skill and chemical knowledge
y impossible wholly to remove writ-
with the common iron and tannin
is almost universally used.

*Inks.*—These are essentially solutions
ters. Red ink is best prepared by
ine in ammonia; blue, by dis-
e in oxalic acid; green, by
methyl green in warm
also be simply prepared,
re not usually met with in
commerce. The desirable properties in all writing-inks are that they shall flow freely and not gum or clog the pen, that they shall remain perfectly fluid (without depositing the colouring matter), and that they shall be reasonably permanent in character.

*Sympathetic Inks.*—These are of great variety, and although possessing an interest to the lover of the marvellous, are not in common use. When weak solutions of cobalt are used (chloride or nitrate), the writing remains invisible until the paper is heated; it then assumes a red colour, which on being exposed to damp air (or breathed upon) changes to green. Salts of lead or bismuth, on being treated with sulphuretted hydrogen, give a black impression. When a weak solution of galls or tannic acid is used the paper on being plunged into a bath of a per-salt of iron will show the characters in black. This is a useful method of restoring faded old writing, and in cases where chemicals have been used with the purpose of removing it.

*Printing-ink.*—This is a greasy or oily compound in which solid pigments are held in suspension, and is altogether different both in appearance and composition from the writing-inks we have described. It also is usually applied to paper surfaces, and amongst other qualities it must possess the property known to printers as '*distribution*'—i.e. of being easily spread out in a layer, the tenuity of which will not cause it to fill up the interstices of and between the types; it must also attach itself to the paper when the type is pressed upon it, detaching itself from the latter entirely; it must possess the apparently opposite properties of drying on the paper within reasonable time, whilst it shall not do so on the type, rollers, or ink-tables; and lastly, it should be permanent in so far as the impressions on paper should have no tendency to change. The various qualities of printing-ink may be described under three heads—viz.: (1) newspaper inks; (2) bookwork inks; and (3) lithographic inks. With the common and consequently cheap printing-inks it is not necessary that the more expensive drying oils be employed as a vehicle or varnish for the colouring matter. Common oils made from paraffin and resin are used, mixed with ordinary lampblack. From this compound, when applied to the surface of printing-paper, the oily matter is absorbed, leaving the colouring matter as a stain on the outside, which does not 'set off' to such an extent as to prevent its employment for cheap periodicals and newspapers. The better class of printing-inks, however, must actually dry upon the surface of the paper in the same manner as paint will dry when applied to a wall. This result is obtained by the employment of drying oils—that is, oils which have the property of absorbing oxygen and becoming gum-like or resinous in character. Thus, when the ink, prepared from linseed, poppy, or walnut oil, is exposed to the atmosphere, especially if assisted by heat, the colouring matter becomes imprisoned or varnished over with a resinous coating, which prevents it setting off or staining any substance brought in contact with it. In preparing the varnish of such inks the oils already mentioned are heated to 500° or 600° F., at which temperature they are kept for a period varying with the degree of viscosity or thickness of the varnish required. In this operation the oil (a compound of fatty acids with glycerine) gradually thickens, without much loss of colour or weight, pungent fumes of acroline, due to the decomposition of the glycerine, being given off. The varnish so produced is mixed with lampblack, prepared either from coal or burning oil, or from the imperfect combustion of gas, and after very careful grinding is in a condition for use.

The manufacture of coloured inks is practically much the same as for black inks, only great care must be exercised to secure the purity of the varnish, and to see that the chemicals employed do not react upon one another. For example, when vermilion (which is a compound of sulphur and mercury) is employed with colours containing iron or lead, the splendid colour of the vermilion is entirely destroyed by the formation of black sulphur compounds with the iron and lead. It is impossible in such an article to give more than the general outline of this manufacture, with which are connected many mysterious processes for which there is no chemical explanation. The technical manuals are said to contain reliable recipes to guide to its manufacture, and we must refer our readers to these for details. The chief drawback in regard to coloured printing-inks is their tendency to fade on exposure to the air and light. This drawback has become more accentuated since the introduction of coal-tar colours, with which it seems to be the rule that the more brilliant and beautiful they are the less are they fit to resist these destructive influences.

In lithography both writing and printing inks are employed, these being of a peculiar character. The former consists of a soapy fluid holding in suspension fatty matters (shellac, white wax, and tallow), which on being transferred to the stone are absorbed and retained by its porosity. The subsequent application of lithographic printing-ink (which is only the finest variety of printing-ink prepared in an especial manner) to the damp surface of the stone causes it to collect and form a layer on the portions which the lithographic writing-ink has penetrated. As in the case of letterpress-inks, those for lithographic purposes are prepared in black and coloured varieties.

Special inks are prepared for collotype and tin-plate printing. Stamping or obliterating inks may either be prepared by thinning down black or coloured letterpress printing-inks with linseed-oil or turpentine, or by grinding aniline colours with glycerine and treacle.

*Indian Ink or China Ink.*—This is a mechanical mixture of the purest and densest lampblack, with a solution of gum, gelatine, or of agar-agar. The black paste is dried and pressed so as to form cakes, in which condition it is sold. The lampblack is prepared by burning sesame or other oils, controlling the supply of air so that in place of a clear flame the carbon from the burning oil is deposited in fine flakes in the form of lampblack. For the very finest varieties the material used for this purpose is camphor. The lampblack or carbon so produced is amorphous, and of an intensely black colour. In this condition it is seldom used for the purpose of ordinary writing, but when rubbed down with water forms a material used by draughtsmen for plans, &c. Inks of a similar nature can be prepared by mixing the solutions already mentioned with colouring matter.

*Marking-ink.*—When certain salts of silver or platinum are applied to textile fabrics these materials are reduced in the fibres of the fabric, and the writing so produced is not removed by the ordinary scouring process to which such articles are subjected. Aniline in the presence of oxidised substances also produces a useful indelible ink.

*Ink-stains.*—The removal of writing-ink stains from linen is easily effected, by alternately dipping the parts in a solution of oxalic acid and hypochlorite of lime (or soda). If the stains be old and have assumed the brown colour of iron mould, warm diluted muriatic acid will be found effectual in their removal. Where the fabric is coloured the removal of ink-stains is more difficult, as the chemicals employed in the former case are inadmissible. In this case a solution of pyrophosphate of soda may be used with advantage, as this salt does not seriously affect even delicate colours. It is of course necessary to thoroughly wash the fabric after the removal of the stains.

**Inkermann,** a village in the Crimea, situated near the eastern extremity of the harbour of Sebastopol. See CRIMEAN WAR.

**Inland Revenue.** See EXCISE, TAXATION.

**Inlaying** is the art of decorating flat surfaces by the insertion of materials differing from the ground or body in which they are inlaid, in colour, texture, or other qualities. The body or basis may be wood, stone, or metal, and the inlaid or encrusted substances may be woods of various colours, ivory, mother-of-pearl, tortoiseshell, precious and other metals, marbles, and hard and precious stones, all these substances being selected principally on account of the brilliance and variety of their colours. Inlaying in wood is known generally as *marquetry;* in metals the inlay principally practised is called *Damascening* (q.v.); and in marble and precious stones it forms a variety of *Mosaic*-work (q.v.). As is the case with most decorative arts, the origin of inlaying can be traced to eastern countries. While some kinds of inlays were known in ancient Rome, the art as practised in modern times first took root in Venice in the 15th century, when small caskets were ornamented with inlays of ivory and wood in strictly geometrical patterns, such as continue to be reproduced to this day in the familiar inlaid-work of Bombay. Contemporaneously the Florentines began to ornament furniture, &c. with small inlaid dice of ivory arranged to form various patterns, and this style of inlay has since be
generally known as Certosa-work, from the
that the choir-fittings in the church of the C
or great Carthusian monastery, near Mil
ornamented in this manner. From these
nings developed the Tarsia-work of It
century later, which, dealing at first
metrical patterns in wood, develop
representations of architecture,
drapery, and finally into fo
modern marquetry. Marquet
was greatly elaborated in F
Holland towards the close o
and workers in wood found g
elaboration of intricate desig
of the 17th century a new
quetry was effected by a
André Boule, in the exc
veneers of tortoiseshell and
Buhl-work. Both in design
work was of remarkable qual
*tortoiseshell was frequently h*
ing of gold or vermilion, and
enriched with skilful engrav
close of the 18th century, whil
most elaborate character was be
many and Italy, the richest trin
were produced in France by the f
Reisner and Roentgen; but the h
*an end for the time to the manufactu*

*Pietra-dura*, which consists of an in
coloured, hard, and precious stones,
marble or in panels of wood, is allied to
mosaic-work which flourished in the pal
Rome; but true mosaic, although embe
not inlaid. Pietra-dura began to be made
in the 15th century, but its extreme co
prevented its extensive application. Two varieties were made in Italy, one being an inlay of minute pieces of stones with colours so arranged as to form a design or picture, like mosaics of larger size. This is known as Roman mosaic, in contradistinction to Florentine mosaic, which consists of slices of

stone shaped and inserted to form definite portions of the required design. This latter class of inlaid-work was introduced into India by a French artist, Austin de Bordeaux, who decorated the famous Taj Mahal at Agra in pietra-dura of the richest and most elaborate character. The art then took root in that region, and to this day pietra-dura of manifestly European character in design continues to be a characteristic art industry of Agra.

The ornamental treatment of metals by inlaying is principally confined to the encrusting and inlaying of wire and fine plates of gold and silver into iron, steel, and bronze. The inlaying of gold and, to a minor degree, silver wire into iron or steel is known as Damascening (q.v.). In India such damascening is known as Kuft-work, and extensively practised in the North-western Provinces. Effective combinations of inferior metals are also made in India; silver inlaid in a black alloy of copper, lead, and tin being known as Bidri-work, from Bidar, in the Deccan. Combinations of copper and brass, and of brass and tin, are also common in the household vessels of the Hindus. The Japanese, who possess many alloys, excel in combining and inlaying them, often in relief, in their art metal manufactures.

**Inn** (ancient *Œnus*), a river of Germany, the most important Alpine affluent of the Danube, rises in the south of the Swiss canton of Grisons, and flows north-east through the valley of the Engadine, and onwards through Tyrol and Bavaria, to its junction with the Danube at Passau in a
ream (320 yards) broader than that of the
anube. Its total course is 317 miles. In Bavaria
s broad and sown with islands.

the legal designation of a house or hotel
ging and refreshment are provided for
generally. Public-houses, &c. are not
cribed as inns unless some rooms are
uests to lodge in. An inn may be
license; but if excisable liquors
er must take out a license;
hotels are made subject to
vent evasion of the law.
nd to open his house to
may not refuse refresh-
person who is able and
such person is drunk or
h infectious disease. He
to give such accommoda-
traveller has a horse and
bound to receive them if
rovided the traveller him-
re as a guest. But the
select whatever room he
ot accept such reasonable
ered, the innkeeper may
ouse. An innkeeper has a
he horse, carriage, or goods
rt of the reckoning appli-
y, and this lien he acquires
e not the property of the
to detain the person of his

law an innkeeper was bound to
rusted to him by his guests, unless
ne *damnum fatale*, or inevit-
effect of a clause in
*caupones, stabularii.*
the English common
bbed of his goods at
le, unless the guest
re of his own pro-
the default or neg-
servant, or com-
t permitted to
ice that he would not be answerable for losses. But the Innkeepers Act, 1863, provides that an innkeeper shall not be liable to make good the loss of any goods, &c. (not being a horse or carriage) to a greater amount than £30, unless the loss has been occasioned by his own wilful default, or the property has been deposited with him for safe custody. A copy of the first section of the act must be exhibited in the hall or entrance to the inn. The liability of innkeepers in respect of goods belonging to their guests extends to all keepers of public-houses, &c., but not to persons who let lodgings. The keeper of a boarding-house or lodging-house is free from liability if he exercises ordinary care—i.e. such care as he takes of his own goods. The Innkeepers Act of 1878 permits a landlord (after giving notice as required by the act) to sell the property of a guest who has left without paying. In Scotland the Roman rule of law as to innkeepers' liability has been adopted, and the law is substantially the same as in England, except that no indictment would lie against an innkeeper for refusing a guest. See further, as to the licenses required by innkeepers, the articles LICENSING LAWS and LIQUOR LAWS.

**Innate Ideas.** See COMMON SENSE, DESCARTES.

**Inner House,** the name given in Scotland to the higher divisions of the Court of Session (q.v.).

**Innerleithen,** a police-burgh (1869) of Peeblesshire, near the Tweed's left bank, 6 miles ESE. of Peebles, and 12 W. of Galashiels. Its first woollen-factory was established in 1790, about which time its saline spring (Scott's 'St Ronan's Well') came into celebrity; but the great extension of its woollen industry dates from fifty years later. Pop. (1841) 463; (1881) 2313.

**Inner Temple,** one of the Inns of Court (q.v.).

**Innes,** COSMO, lawyer, antiquary, and historian, was born at Durris, on Deeside, 9th September 1798. His father, formerly the laird of Leuchars, was a scion of the old family of Innes of Innes. Cosmo was educated at the Edinburgh High School, and he graduated both at Glasgow and Oxford. In 1822 he passed as a Scottish advocate, became sheriff of Moray in 1840, and subsequently was appointed clerk to the Second Division of the Court of Session. In 1846 he was elected to the (unpaid) chair of History in the university of Edinburgh. Cosmo Innes is perhaps best known as the author of *Scotland in the Middle Ages* (1860), and *Sketches of Early Scotch History* (1861), but he also prepared the first volume of *Acts of the Scottish Parliament*, and at the time of his death was engaged on an index to the whole series. He was further a most industrious member of the Bannatyne, Maitland, and Spalding Clubs, and edited for them several of the register-books of the old religious houses of Scotland, with other historical documents of great importance. He published a volume of lectures on *Legal Antiquities* (1872), and was the author of several memoirs, including one of Dean Ramsay. Cosmo Innes died suddenly at Killin, 31st July 1874, in his seventy-sixth year. See the Memoir by his daughter, Mrs Hill Burton (1874).

**Innes,** THOMAS, a Scottish historian, known better as 'Father Innes,' was born in 1662 at Drumgask, on Deeside, Aberdeenshire. At fifteen he was sent to Paris, where he studied at the College of Navarre and the Scots College, of which latter body his eldest brother Lewis (1651–1738) was principal from 1682. Thomas received priest's orders in 1692, and after three years of mission work at Inveraven, Banffshire (1698–1701), returned to Paris, and became prefect of studies in the Scots

College, where he died, 28th January 1744. To pursue his researches he had paid a visit or two to England and Scotland; and Wodrow, who saw him at Edinburgh in 1724, describes him as 'a monkish, bookish person, who meddles with nothing but literature.' Withal he was a staunch Jacobite, but no Ultramontane; not free, indeed, from suspicion of Jansenism. He may justly be looked on as the precursor of Niebuhr and Niebuhr's successors; for his *Critical Essay on the Ancient Inhabitants of Scotland* (2 vols. 1729) is much the earliest of all scientific histories. It was meant for an introduction to a *Civil and Ecclesiastical History of Scotland*, one volume of which, coming down to Columba's death, he prepared for the press, whilst another, bringing down the narrative to 831, was left incomplete. Both were edited for the Spalding Club by Dr Grub in 1853. The aim of the whole work was '*to counteract the inventions of former historians* [Hector Boece], and to go to the bottom of the dark contrivances of factious men [George Buchanan] against the sovereignty of our kings;' and, though he thus wrote with a purpose, his honesty and acumen were such that the work retains a permanent value. See the Memoir by Dr Grub prefixed to the reprint of the *Critical Essay* ('Historians of Scotland' series, vol. viii. 1879).

**Innocent**, the name of thirteen popes, the most remarkable of whom are the following.—INNOCENT I., a native of Albano, was elected Bishop of Rome in 402. Next to the pontificate of Leo the Great that of Innocent forms the most important epoch in the history of the relations of the see of Rome with the other churches, both of the East and of the West. He was earnest and vigorous in enforcing the celibacy of the clergy. He maintained with a firm hand the right of the Bishop of Rome to receive and to judge appeals from other churches, and his letters abound with assertions of universal jurisdiction, to which Catholics appeal as evidence of the early exercise of the Roman primacy. Innocent I. died in 417, and was afterwards canonised, his day being July 28.

INNOCENT III. (LOTHARIO CONTI), by far the greatest pope of this name, was born at Anagni in 1161. After a course of much distinction at Paris, Bologna, and Rome, he was made cardinal; and eventually in 1198 was elected, at the unprecedentedly early age of thirty-seven, a successor of Pope Celestine III. His pontificate is justly regarded as the culminating point of the temporal as well as the spiritual supremacy of the Roman see; under the impulse of his ardent but disinterested zeal for the glory of the church, almost every state and kingdom was brought into subjection. In Italy, during the minority of Frederick II., who was a ward of Innocent's, the authority of the pope within his own states was fully consolidated, and his influence among the other states of Italy was confirmed and extended. In Germany he adjudicated with authority upon the rival claims of Otto the Guelph and Philip of Swabia; in France he compelled Philip Augustus to dismiss Agnes de Meranie, whom he had unlawfully married, and to take back Ingeburga. In Spain he exercised a similar authority over the king of Leon. The history of his conflict with and triumph over John of England displays in a stronger light the extent of his pretensions and the completeness of his supremacy. Even the king of Armenia, Leo, received his legates. And, as if in order that nothing might be wanting to the completeness of his authority throughout the then known world, the Latin conquest of Constantinople and the establishment of the Latin kingdom of Jerusalem put an end, at least during his pontificate, to the shadowy pretensions of the eastern rivals of his power, spiritual as well as temporal. His views of the absoluteness of the authority of the church within her own dominion were no less unbending than his notion of the universality of its extent. To him every offence against religion was a crime against society, and in his ideal Christian republic every heresy was a rebellion which it was the duty of the rulers to resist and repress. It was at his call, therefore, that the crusade against the Albigenses was organised and undertaken. As an ecclesiastical administrator Innocent holds a high place in his order. He was a vigorous guardian of public and private morality, a steady protector of the weak, zealous in the repression of simony and other abuses of the time. He prohibited the arbitrary multiplication of religious orders by private authority, but he lent all the force of his power and influence to the remarkable spiritual movement in which the two great orders, the Franciscan and the Dominican, had their origin. It was under him that the celebrated fourth Lateran Council was held in 1215. In the following year he was seized with his fatal illness, and died in July at Perugia at the early age of fifty-six. His works embrace sermons, a remarkable treatise on the *Misery of the Condition of Man*, and a large number of letters. The 'golden sequence' 'Veni, sancte Spiritus' has been attributed to him by some. It is from his letters and his decretals alone that the character of the age and the true significance of the church policy of this extraordinary man can be fully understood. However earnestly men may dissent from these views, no student of medieval history will refuse to accept Dean Milman's verdict on the career of Innocent III.
that 'his high and blameless, and, in some res
wise and gentle character, seems to approach
nearly than any one of the whole succes
Roman bishops to the ideal light of a s
pontiff;' and that 'in him, if ever, may
be realised the churchman's highest conc
vicar of Christ.'

See Milman's *Latin Christianity*,
*Histoire du Pape Innocent III.* (18
in German by F. Hurter (1834-
Schwemer (1882), and Brischar (1

INNOCENT XI. (BENEDETT
at Como in 1611 and electe
the most distinguished amon
century. He was a vigorous
but his historical celebrity
contest with Louis XIV. T
an attempt on the part of
to the abuse of the king's
virtue of what was called th
appropriating their revenu
this attempt drew forth the
of the French clergy as to th
But the actual conflict rega
enjoyed by the foreign amba
Rome, and especially the right
they claimed not only for their ow
also for the adjoining district. Th
gradually become so many nests
frauds upon the revenue; and the p
that he would not thereafter receive
of any new ambassador who should
these abusive claims. The great powe
at this threat, but it was with Fra
crisis occurred. Louis XIV. instructe
ambassador to maintain the dignity of F
sent a large body of military and naval
support his pretensions. Innocent pers
refusing to grant an audience to the ambassador. Louis, in reprisal, seized on the papal territory of Avignon; but the pope was immovable, and the dispute was not adjusted till the following pontificate. Innocent died in 1689. His noble and

unselfish character is sympathetically sketched by Browning in *The Ring and the Book*.

**Innocents,** HOLY. See CHILDERMAS.

**Innominate Artery** (*Arteria innominata*) is the first large branch given off from the arch of the Aorta (q.v.).

**Innominate Bone.** See PELVIS.

**Innsbruck,** the capital of Tyrol,' 109 miles by rail S. of Munich, stands on the Inn at its junction with the Sill, 1880 feet above sea-level, surrounded and overhung by mountains ranging from 7500 to 8500 feet high. It is a beautiful place, with broad tree-shaded streets, arcaded shops, and four squares adorned with statues. The Franciscan church, or Hofkirche, built in the Renaissance style in 1553-63, contains a beautiful and elaborate monument to the Emperor Maximilian I. (who, however, is buried in Vienna). It consists of a marble sarcophagus supporting the emperor's effigy in bronze, in a kneeling posture; while on both sides of the aisle are twenty-eight bronze figures of royal (mostly Hapsburg) personages, by Peter Vischer and other German artists. In the same church are monuments to Andreas Hofer and his comrades Speckbacher and Haspinger, and to the Tyrolese who fell in the wars against France (1796-1809). The parish church of St James has a picture of the Virgin by Lucas Cranach. The other chief buildings are the imperial castle, built by Maximilian I. and restored by Maria Theresa in 1766-70; the 'Golden Roof Palace;' the national museum, the Ferdinandeum; and the university (founded in 1677,
ᵃᵈ after several vicissitudes, organised anew in
hich has the usual four faculties and
of 700 students and 75 professors and
To the university are attached a library
volumes, a botanical garden especially
'ne flora, and the usual museums,
c. Amongst the eight monasteries
the first that the Capuchins
(1594). Innsbruck carries on
n cloth, machines, and glass,
's much visited by tourists
880) 20,537; or, including
nd Wilten, 28,790. Inns-
lace of some commercial
situation at the ford
ead of the Brenner Pass
ad here their principal
180 the town belonged
in 1363 it passed with
tormiest period of its
of Hofer (q.v.). See
*'sscn Umgebung* (1880).

lame given to certain
ave the exclusive right
e English bar. These
n the 13th century, when
ise in the law-courts, and
by lay professors, 'appren-
aw who congregated in the
estminster. There are four
ln's Inn, the Inner Temple,
and Gray's Inn. Each possesses
rary, and chapel, the Temple
ed as a chapel by both the societies
ir name from the buildings which
to the Knights Templars. Each
onsiderable income from houses and
upied by barristers and others, and
erned by an irresponsible body called
New members of this body, who are
ior counsel, are chosen by
The inns possess equal
vhen a royal commission
ies and constitution, they
have joined in providing lectures for the benefit of students, and in examining candidates for admission to the bar. They have discretion to admit or refuse any candidate without assigning their reasons; but no objection is made to the admission of any person of good character. Each inn exercises discipline over its own members, and has power to disbar them—i.e. to withdraw from them the right to practise; but there is an appeal to the judges from the decision of the benchers. The right of disbarring is exercised only in the case of persons guilty of criminal offences or gross professional misconduct; a formal inquiry is held, but the results of the investigation are not made public. Serjeants' Inn was formerly a society composed of barristers and judges belonging to the 'order of the coif;' but this inn was abolished in 1877. The smaller societies, sometimes called Inns of Chancery, have never been of any great importance; their buildings have passed into the possession of one or other of the inns of court, or have become the property of small private societies of solicitors, &c. Staple Inn and Clement's Inn are interesting by reason of the collegiate character of their buildings. For further information, see the Report of the Commission of 1855. The steward of any of the inns of court will furnish intending candidates for the bar with information as to the terms of admission, &c. See BARRISTER, and Pearce's *History of the Inns of Court* (1848).

The society known as the King's Inns in Dublin performs the duties of an inn of court in relation to the Irish bar. The Scottish bar is organised on an entirely different plan (see ADVOCATE).

**Innuendo,** a part of a pleading in cases of libel and slander, pointing out what and who was meant by the libellous matter or description.

**Inoculation** ('engrafting'), the communication of disease to a healthy subject by the introduction of a specific germ or animal poison into his system by puncture or otherwise, originally used of the inoculation of smallpox (for preventive inoculation, see BACTERIA, GERM, ANTHRAX, HYDROPHOBIA). If the matter of a variolus (or smallpox) pustule, taken after the commencement of the eighth day, be inserted in or beneath the skin of a person who has not previously suffered from smallpox, the following phenomena are induced: (1) Local inflammation is set up; (2) on the seventh or eighth day there is fever similar to that of smallpox; and (3) after the lapse of three more days there is a more or less abundant eruption of pustules. This process is termed inoculation, and the disease thus produced is denominated inoculated smallpox. The disease produced in this artificial manner is much simpler and less dangerous than ordinary smallpox; and as it was an almost certain means of preventing a subsequent attack of the ordinary disease, inoculation was much practised till it was superseded in the beginning of this century by Jenner's introduction of vaccination. The importance of inoculation was recognised in the East at a very early period, the Chinese practising it from the 6th century, and the Brahmins from a very remote antiquity. In Persia, Armenia, and Georgia it was in use, and it is even said to have been employed in Scotland and Wales. It was not, however, till Lady Mary Wortley Montagu wrote her celebrated letter from Adrianople in 1717 that the operation became generally known in England. In that letter she writes: 'The smallpox, so fatal and so general amongst us, is here entirely harmless, by the invention of *engrafting*, which is the term they give it. Every year thousands undergo the operation. There is no example of any one who has died of it, and you may believe that I am well satisfied of the safety of this experiment, since I intend to try it on my dear little son.' Four years afterwards she had her daughter publicly inoculated in England; the experiment was then performed successfully on six condemned criminals at Newgate, and on the strength of these successful cases two children of Caroline, Princess of Wales, were inoculated, which gave a sanction to the practice.

Inoculation was not, however, thoroughly established for more than a quarter of a century after its introduction. It met with violent opposition both from the medical profession and the clergy. A sermon is extant which was preached in 1722, by the Rev. Edward Massey, in which it is asserted that 'Job's distemper was confluent smallpox, and that he had been inoculated by the devil.' The great drawback to inoculation turned out, however, to be this: while it was invaluable to him who underwent the operation, and completely guarded him from the natural disease in its severe form, its effect upon the community at large was extremely pernicious in keeping alive the natural disease, and increasing its spread amongst those who were not protected by inoculation. While one in five or six of those who took the natural disease died, the average number of deaths at the Inoculation Hospital was only 3 in 1000; and yet, according to the authority of Heberden, in every thousand deaths within the bills of mortality in the first thirty years of the 18th century (before inoculation was at all general) only seventy-four were due to smallpox. The deaths from this disease amounted to 95 in 1000 during the last thirty years of the century; so that, notwithstanding the preservative effects of inoculation on almost all who were operated on, the total number of deaths from this disease increased in one hundred years in the ratio of about 5 to 4. At the beginning of the 18th century about one-fourteenth of the population died of smallpox; whereas at the latter end of the same century the number (notwithstanding, or perhaps rather in consequence of, inoculation) had increased to one-tenth; and this immense consumption of human lives was not the total evil, for many survivors were left with the partial or entire loss of sight and with constitutions destroyed. The benefits which were expected from inoculation were far from being realised, and smallpox would doubtless have gone on increasing in its destructive power if it had not been checked by Jenner's discovery of *Vaccination* (*q.v.*). Inoculation was forbidden by law in 1840.

**Inowraclaw,** called also Jung-Breslau ('Young Breslau'), a town of Prussia, is situated near the Polish frontier, 66 miles NE. of Posen. Its chief industries are salt-mining, the manufacture of salt and machines, and iron-founding. Pop. (1875) 9139; (1885) 13,548.

**In partibus infidelium** (*Lat.*, 'in the regions of the unbelievers'). Titular bishops in the Church of Rome were from the 13th century until the pontificate of Leo XIII. styled bishops *in partibus infidelium*. They were originally bishops who had no diocese, and took their titles from places where there was no longer a bishop's see. The usage originated after the Greek schism, and became general in the time of the Crusades. The places conquered by the crusaders in the East were furnished with Roman Catholic bishops; but when these conquests were again lost the popes continued to appoint and consecrate the bishops as a continual protest against the power which had prevailed over their alleged right, and to signify their hope of restitution. But in Britain, the assumption of territorial titles being illegal and dangerous, the Roman Catholic bishops actually resident long bore titles derived from such distant places. In 1850 their assumption of titles from their actual sees gave prodigious offence in England, and led to the passing of the *Ecclesiastical Titles Bill* (q.v.), which, however, remained a dead letter, and was repealed in 1871.

**Inquest.** See Coroner.

**Inquisition,** called also 'the Holy Office,' a tribunal in the Roman Catholic Church for the discovery, repression, and punishment of heresy, unbelief, and other offences against religion. From the very first establishment of Christianity as the religion of the Roman empire laws more or less severe existed, as in most of the ancient religions, for the repression and punishment of dissent from the national creed; and the emperors Theodosius and Justinian appointed officials called 'inquisitors,' whose special duty it was to discover and to prosecute before the civil tribunals offences of this class. The ecclesiastical cognisance of heresy and its punishment by spiritual censures belonged to the bishop or the episcopal synod; but no special machinery for the purpose was devised until the spread in the 11th and 12th centuries of certain sects, reputed dangerous alike to the state and to the church—the Cathari, Waldenses, and Albigenses—excited the alarm of the civil as well as of the ecclesiastical authorities. In the then condition of the public mind, however differently it is now constituted, heresy was regarded as a crime against the state, no less than against the church. An extraordinary commission was sent by Pope Innocent III. into the south of
France to aid the local authorities in ch
the spread of the Albigensian heresy. The
Lateran Council (1215) earnestly impress
on bishops and magistrates the necessity
creased vigilance against heresy; and
held at Toulouse directed that in each
priest and two or three laymen of
should be appointed to examine
the bishop all such offences dis
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Innocent IV., in 1248, a s
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